The

Refrigeration Service Engineer

Vol. 6
No. 6

JUNE • 1938

BUILDING AN ON AND OFF
RECORDER — SERVICE DATA
ON COLDSPOT REFRIGERATOR

Here is the Evidence

LOS ANGELES, CALIF.—When I use one of your seals I know that my seal problems are over. *Elwood Simcoe, 1425½ S. Kenmore St.*

FLINT, MICH.—I have used Rotary Seals for several years and have the first one to find that did not give perfect satisfaction. Have never found one that leaked or squeaked.
B. S. Lister, 1619 Dakota St.

ATCHISON, KANSAS—I have been using Rotary Seals for three years and never had a single one fail. I have so much faith in Rotary Seals that I would not let a compressor out of my shop without one on it.
F. M. Terry, 425 Commercial St.

BAYSIDE, L. I., N. Y.—I have been using Rotary Seal Replacement Units for several years and have found them in every way very satisfactory. In fact, I have not yet had a service call on one in use.
David J. Turner, 39 Bell Blvd.

SCRANTON, PA.—I have been using Rotary Seal Replacement Units for some time and find them very efficient. They are tops with me.
William Williams, 1513 Swetland St.

CORVALLIS, OREGON—I think the Rotary Seal is a boom to the service man in outlying districts where there are no shop facilities. It also makes salvageable many an otherwise no-good compressor.
Donovan Kuhl, 429 S. 6th St.

LEESBURG, FLA.—I used the first Rotary Seals about three years ago with a bit of mistrust. But they are still holding and Rotary Seals are a necessary part of my present stock.
C. V. Millikan, 1217 W. Main St.

CHICAGO, ILL.—I have used your Rotary Seals for a long time and through the satisfactory performance of the seals regardless of the job, have won many customers. I have yet the first seal to go bad on me. Thanks to your company for such a great product.
Roland Refrig. Service, 2538 N. Cicero Ave.

WASHINGTON, D. C.—Have used at least five hundred Rotary Seals and have never had one call back. *Quantrill Refrigeration Co., 2127—15th St., N. W.*

MINNEAPOLIS, MINN.—To save time and money we use Rotary Seals.
Otto Chermak, 1518 W. Broadway.

WHITE PLAINS, N. Y.—For perfect self-alignment and labor saving installation, the Rotary Seal has proven itself beyond expectations. They are reasonably priced, quickly installed, and give the best results. We recommend Rotary Seals to each and every service man. *Irving Isaacs, 82 Bank St.*

ST. LOUIS, MO.—There are many time savers on the market, but Rotary Seals are the dependable time savers. Have used Rotary Seals since they came on the market and never had to replace one after I installed it.
Joe E. Mika, 3221a Texas Ave.

SAN PEDRO, CALIF.—I have been thankful many times for having a Rotary Seal on hand when a shaft has been grooved and I have to get a machine in commission in a hurry. I have never yet had one fail. I think they are a great help to a man at sea where parts are scarce. *W. L. Krigbaum, U. S. S. Arizona.*

PUEBLO, COLO.—I discovered Rotary Seals through the Refrigeration Service Engineer magazine about two years ago and have been using them since with good results.
W. W. Boody, 1612 W. 18th St.

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Joseph Stella, 2104 Washington Rd.

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Milton Romstedt, 309—6th St.

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—You are the Jury

MADISON, WISC.—I have used Rotary Seals on nearly all of our seal replacement jobs for the past two years. In most cases they are much better than the original equipment and so very much easier to install. I have had cases where nothing else would work.
Milo W. Raymond.

BALTIMORE, MD.—In my opinion the Rotary Seal Replacement Unit is the best that can be bought because it requires no running-in when installing and eliminates trouble calls, due to its simple construction and quality of workmanship and material.
Eldridge Horman, 118 Collins Ave.

WAYNE, NEBR.—Rotary Seals save me time, trouble and money. My customers save and I realize a better profit.
Elmer A. Meyers, 110 West Third St.

WILMINGTON, DELA.—We have found the Rotary Seals are so good that we refuse to even consider using any other make.
J. H. Houser, 701 West St.

CLAYTON, MO.—I use Rotary Seals for all replacements, installing most of them on the job without removing the compressor. In my experiences, I have never found it necessary to remove or replace a Rotary Seal.
Arthur Schrepfer.

WASHINGTON, D. C.—Rotary Seal Replacement Units in my opinion cannot be beaten. I use about 500 a year in rebuilding condensing units. They have yet to fail if properly installed. *L. M. Hubbard, 61 Seaton Pl., N. W.*

MARTINEZ, CALIF.—I use Rotary Seals exclusively, having used about 300 in the past two years. *V. Lee McNew, P. O. Box 246.*

BRONX, N. Y.—We have been using Rotary Seals ever since their appearance on the market and have always had perfect satisfaction. The use of Rotary Seals has helped us save both time and money. Your product has supplied a genuine need in the refrigeration business.
Polar Refrigeration Service Co., 1204 Morrison Ave.

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Gailard Cheever.

E. PORT CHESTER, N. Y.—I have been using Rotary Seals for the last three years and will not use any others. I swear by them, never at them. *M. P. Schlosser, Smith St., Highland Pk.*

INDEPENDENCE, KANSAS—We have used Rotary Seal Replacement Units for some time, having a large number of them in the field at present, and have always found them dependable and entirely satisfactory.
Art Marion's Service.

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EAST LIVERPOOL, OHIO—The only engineered shaft seal having all the characteristics essential to maintain the highest degree of performance. *J. F. Bryer, 117 W. Sixth St.*

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A. Wolff, 56 Clipper St.

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RACINE, WISC.—We use Rotary Seals exclusively and find them very satisfactory.
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KANSAS CITY, MO.—We have been using Rotary Seals since they were first put on the market with excellent results.
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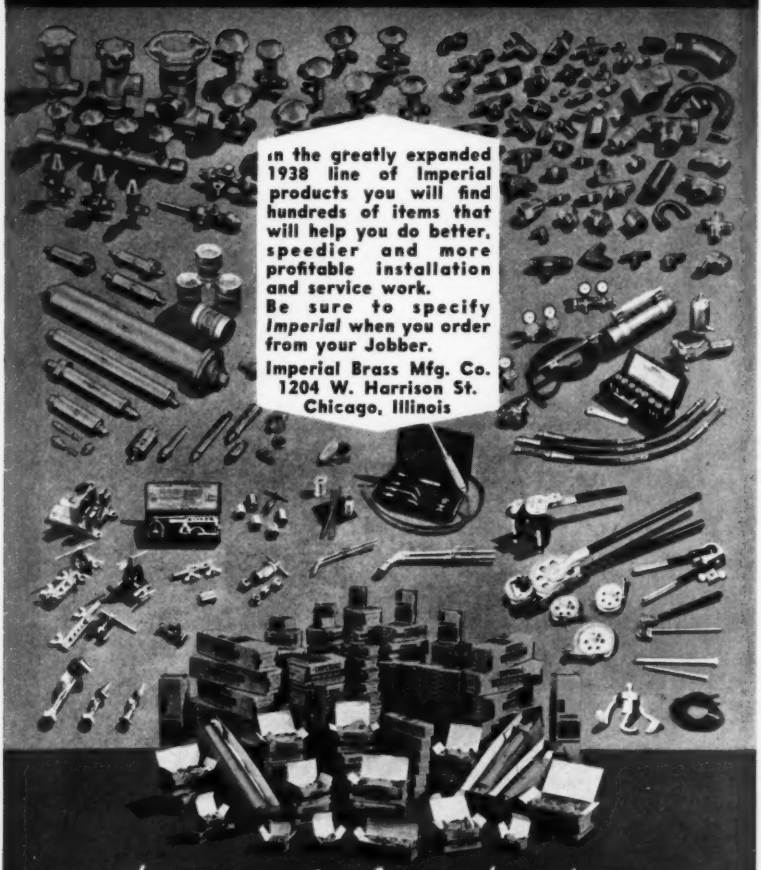
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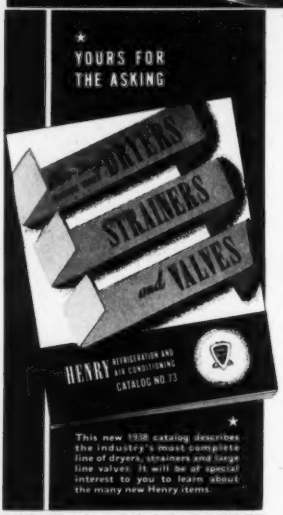
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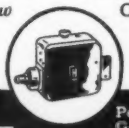

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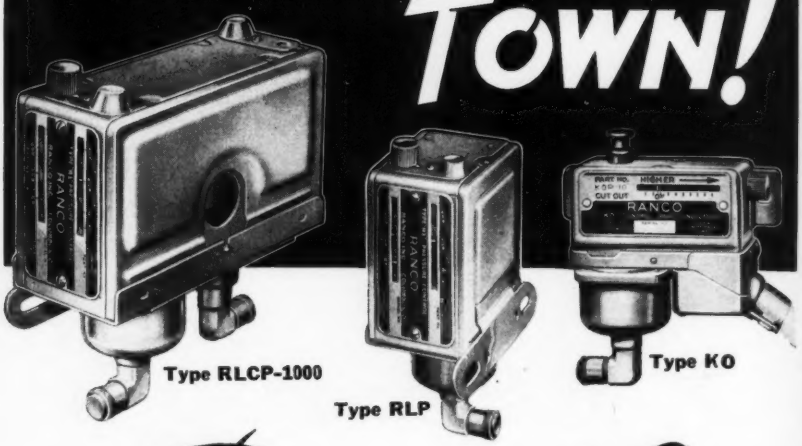

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The Refrigeration Service Engineer

Vol. 6 No. 6

June, 1938

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

Official Organ
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Cover

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The Refrigeration Service Engineer

VOL. 6, No. 6 CHICAGO, JUNE, 1938 $2.00 per Annum

Building an On and Off Recorder

By H. D. BUSBY

A VERY necessary piece of equipment to the service shop is an on and off recording instrument, which will record on a chart, the length of the running and idle periods of a refrigerator. In many cases of customer complaints, it is the only possible means of overcoming the suspicion that the machine is running more than it should. Any amount of argument cannot satisfy the customer, but visual proof, such as provided by the on and off recorder, is convincing at a glance.

There are several such devices on the market at the present time, all of which do a very good job according to their design. There are two disadvantages to nearly all of them, however, which prevent the average shop from using them. The first of these is the high original cost, which makes it prohibitive to the smaller shop owner, and the continuous cost and inconvenience, thereafter, of special charts and inks, which have to be used with the instrument. The second disadvantage is the fact that those on the market today cannot be used on all sizes of domestic machines. Electric refrigerators today operate on a wattage ranging from 60 to 400 watts, depending on the size and make, whereas the recording instruments on the market will cover a range of only 100 to 400 watts.

With these facts in mind, the writer set about building an instrument which would perform all the feats of any other, plus overcoming the disadvantages mentioned in the foregoing, with the results illustrated in the following. The total cost of the material used in this device, not including the miscellaneous pieces of metal which were found around the work bench, was $2.60.

The paper used on this instrument is a roll of ordinary adding machine tape, which may be purchased from any stationery store in your neighborhood. The size is 2¼ inches wide by approximately 250 feet long. A narrower, or wider, roll would work equally as well without any changes in the construction. One roll of tape will be sufficient to make about 125 charts of a 24-hour test each.

The drum, on which the chart is wound during the test, is made of wood turned in a lathe to four inches in diameter and 2⅛ inches wide. A ¼-inch hole is bored through the center for the drive shaft. This drum, of course, may be made in any size desired. It is desirable, however, to make it large enough so ample space is allowed on the paper for each hour to clearly read operating periods as short as five minutes. Since the drum is attached to the hour hand of the clock, it makes one complete revolution every 12 hours. The dots on the chart, shown in

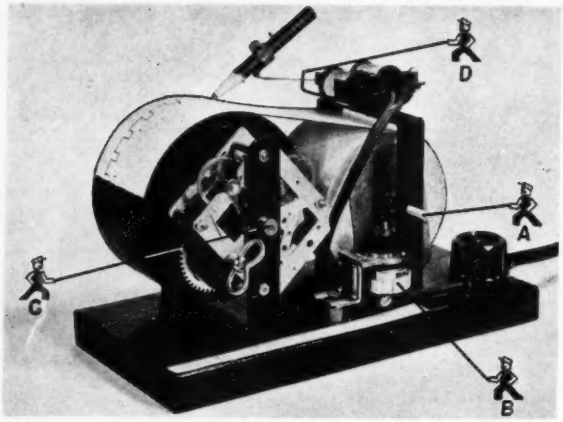


FIG. 1—REAR VIEW OF INSTRUMENT

A—Paper friction plate, spring, washer and tension adjusting nut.
B—Automobile heater switch used as bypass.
C—Time set knob. Can be used to unwind paper on drum.
D—Galvanized iron wire soldered to coil frame—used as a stop for pencil arm.

Fig. 1, are made by pins driven into the wooden drum. These pins serve the double duty of gripping the paper on the drum so it will wind up without slipping, and marking each hour on the chart by perforating the paper at that point. If desired, more pins can be inserted to make one-half hour periods. Since the drum makes one revolution every 12 hours, we will need 12 pins, at equal distances apart, around the circumference. Wrap a strip of paper around the drum, and cut it so the two ends butt closely together where they meet. This piece of paper when removed will then be equal to the exact circumference of the drum. With a rule, divide this strip into 12 equal parts, replace it on the drum, and drive common paper pins into the wood at the points marked. Cut the pins off to a length of about 1/8-inch and sharpen the ends with a file, so they will easily perforate the paper as it winds on the drum.

The shaft for the drum is made of 1/4-inch round brass rod, about 1/2-inch longer than the width of the drum. Since this is to be fastened to the shaft containing the hour hand of the clock, drill a hole in the end of the brass rod slightly larger than the clock shaft, and then press the rod into the drum, allowing about 1/4-inch projecting from each side.

The clock used is a $1.00 alarm clock, and while this worked satisfactorily, it is probably advisable to put a little more money into this piece of equipment, so that trouble may be avoided in the future. The alarm mechanism and spring were removed before assembling, and the spring used as described in another part of this article. The clock casing, hands and face were also removed. In assembling to the drum, the small pinion and shaft to which the hour hand was attached, were inserted in the drum shaft and soldered in place.

Two brackets, as shown in Fig. 2, were made of strip metal 1/16-inch thick by 3/4-inch wide. The short side of bracket (E) is 2 3/4 inches high and the long side 4 1/8 inches high. Overall width is 3 3/4 inches. A hole 2 5/16 inches from the bottom of the bracket is drilled through both sides, acting as the bearing for the drum shaft on one side, while the other side is drilled large enough so that the time set knob on the clock will pass through. Two additional holes were drilled in the long side of the bracket, which were used for mounting the clock. The bottom part of the bracket is drilled for two wood screws for mounting the wooden base.

Bracket (F) is 3 7/8 inches high by three inches wide. A hole for the paper roll shaft is drilled through both sides two inches from the bottom. This bracket is also mounted to the base with wood screws. A long 3/16-inch bolt, which acts as the paper roll shaft, a friction plate, small spring, washer and tension adjusting nut complete the paper holder.

The base of this instrument is made of 3/4-inch wood, 4 1/4 inches wide by 9 1/4 inches long. This could also be made of metal, if desired, and the brackets and other parts soldered, or bolted, to it.

In trying to find a suitable magnet coil for this purpose, it was found that it is not possible to build one that will operate on a range of wattages so wide apart. The coils from an ordinary house doorbell, of the two coil type, were found to have about the best

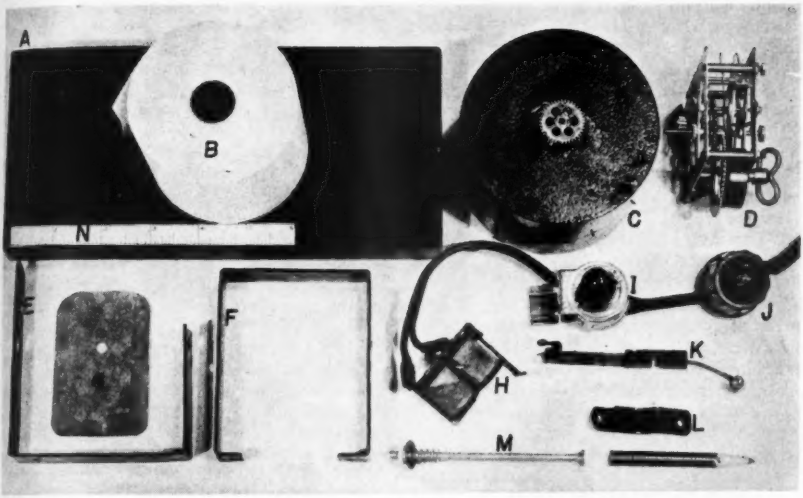


FIG 2—PARTS REQUIRED FOR ON AND OFF RECORDER

A—Base.
B—Paper Roll.
C—Winding Drum.
D—Clock Mechanism.
E—Clock and Drum Bracket.
F—Paper Roll Bracket.
G—Friction Plate.
H—Doorbell Coils.
I—Variable Resistance.
J—Electrical Outlet.
K—Magnet Arm.
L—Magnet Arm Bracket.
M—Paper Roll Shaft, Spring, Washer and Adjusting Nut.
N—Time Scale.

characteristics of any commonly used coils, when used in conjunction with a by-pass to prevent too much current from passing through the magnet coils when connected in series with the higher wattage motors. This by-pass is a variable resistance and switch from an automobile hot water heater, connected as shown in Fig. 3. The two magnet coils are connected in series with the appli-

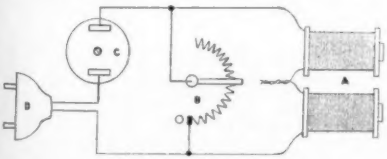


FIG. 3—WIRING DIAGRAM

A—Doorbell Coils.
B—Variable Resistor.
C—Appliance Outlet.
D—Plug to 110 V. Line.

ance motor and the power supply through an attachment plug and the plug receptacle, so that the instrument may be plugged into the wall socket, and the appliance cord plugged into the instrument, thus making it unnecessary to tap any wires in the appliance. The by-pass is connected across the line going to the magnet coils.

In operation, it is found that the magnet will operate without overheating in series with motors drawing from 60 to 200 watts, without the by-pass in the circuit. The heater switch knob for these wattages is turned to the "off" position. For wattages from 200 to 500 watts, it is necessary to adjust the heater switch for the amount of resistance necessary for the wattage being

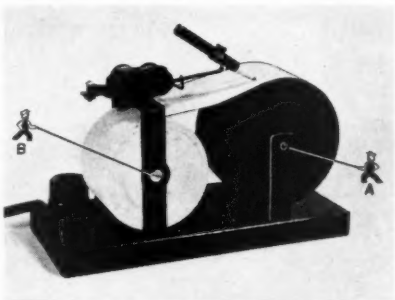


FIG. 4—FRONT VIEW OF RECORDER

A—Install 1/16 inch washer at this point.
B—3/16 inch by 3½ inch bolt used for paper roll shaft.

pulled by the motor. This resistance acts as a by-pass for some of the current, but provides enough resistance so that sufficient current is forced through the magnet coil to operate it. The length of this resistance coil is reduced with the increase of the wattage pulled by the appliance motor. Just

enough resistance should be used to operate the magnet without overheating. To determine this amount, turn the heater switch knob from the point marked "high" gradually in the direction of the point marked "low" until the magnet coil arm pulls up. The switch dial may be marked as these points are determined.

The magnet coils, with their original frame, are mounted with one screw on top of the paper roll bracket, as shown in Fig. 1 and 4. This screw also holds the small bracket (L, Fig. 2) for the magnet arm.

The magnet arm, or armature, which drives the pencil, is made up of two pieces of flat spring steel, two pieces of square soft iron, and a short strip of copper. The two springs and pencil clip are made from the alarm mechanism spring, which was removed from the clock. One of these springs creates a counter-pull against the magnetic force of the coil, and returns the arm to the starting position when the current is off. The other spring provides a pressure of the pencil against the paper. The iron blocks are ¼-inch by ¼-inch by ½-inch long, slotted with a hacksaw through their length to within ⅛-inch of the end. In this slot is inserted one end of the spring, and the block is then mashed down so that the spring is gripped tightly in the slot. A small hole is drilled through both spring and block, and a nail driven in and riveted. The two blocks are spaced about ⅛-inch apart, and held in line with a strip of about ⅛-inch copper, soldered to each block. This space, bridged only by the copper, is very necessary, because if one long piece of steel was used, a closed magnetic circuit is created when the magnet arm is pulled up, and the arm will not release for several minutes after the current is off. The space between these blocks is for the purpose of breaking the magnetic circuit. A loop is bent in the flat spring at one end of the arm for the purpose of mounting rigidly with a small machine screw on one end of the arm bracket (L). To the other end of the arm is riveted a pencil clip, as shown in Fig. 5, which is also made from the spring steel. If you have trouble bending this spring steel, it may be softened by holding over a flame until a red heat is reached, and then allowed to cool slowly. The material will still retain sufficient spring for the purpose, but will be pliable enough to bend with pliers without breaking.

After the entire instrument has been assembled, as shown in Fig. 1, adjustment should be made with a 60-watt bulb, plugged into the appliance outlet. The tension of the pencil against the paper should be just enough to permit a clearly readable line. A No. 3 lead pencil, kept well sharpened, will be found suitable for use on this instrument. The spring tension against the pull of the magnet should be sufficient to return the pencil to the starting position, and not so much that when the 60-watt lamp is connected, the coil will not pull the arm up. The arm must be adjusted so that the iron blocks fit perfectly flat against the coil cores when the arm is pulled up. If they do not, considerable chattering of the arm will result.

Fig. 6 is a chart of the operating periods of the writer's refrigerator, made with this instrument. For the average test, markings one hour apart, as provided by the perforations in the paper, are sufficient. Occasionally, however, it is desirable to determine

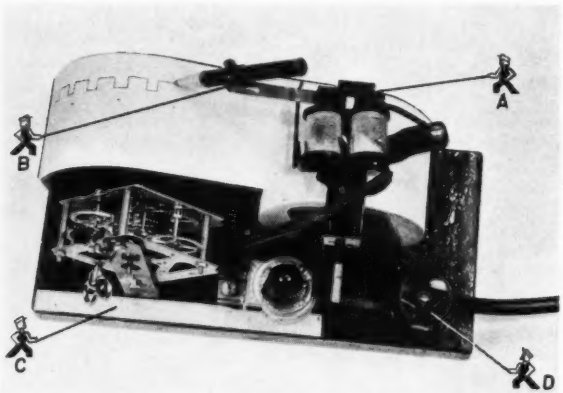


FIG. 5—TOP VIEW OF RECORDER

A—Armature or pencil arm—note how the steel blocks are separated with a copper strip soldered to them as the only connecting link.

B—Pencil clip made of clock spring.

C—Scale measuring exact length of running periods.

D—Appliance outlet.

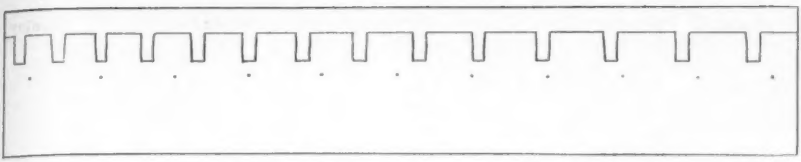


FIG. 6—SAMPLE CHART MADE WITH THE RECORDING INSTRUMENT

the exact length of the running and idle periods. To provide a means of doing this, a strip of the perforated paper was taken, and the one hour spaces between perforations were further divided into 12 equal spaces, producing the scale as shown in Fig. 2(N). Each graduation on this scale then represents five minutes. The scale may be glued to the base of the instrument, as shown, or to a separate strip of wood. In either case, it is a simple matter to measure the actual space of time for any on or off period.

Of course, the instrument should have a carrying case to protect it from dust or damage, and while one is not shown here, it is an easy matter to make one of sheet metal, or ¼-inch plywood, hinged to the clock end of the base with a snap fastener at the opposite end. The convenience of this case may be further improved by inserting a small glass window in the case, 2¼ inches square, directly over the drum, so the chart may be viewed while the instrument is in operation without opening the case.

The time set knob on the clock will be found to be a convenient means of unwinding the paper from the drum after a chart is made.

Service Data on The Coldspot Refrigerator

Continued from the May issue with information on later models

Checking Adjustments

EXPANSION valve adjustments on the later models can be determined with an accurate gauge or a thermometer. Since the use of a gauge, however, involves the opening of the system, and consequently, danger of moisture, it is recommended that a thermometer be used. If a good contact between the thermometer bulb and the ice tray shelf is obtained, the thermometer will accurately indicate the expansion valve setting. Remove the ice trays and melt frost or ice off the bottom shelf where the thermometer is to be placed. Lay the thermometer at an angle so the bulb is in contact with the metal shelf about four inches from the front left side. It should be so arranged that readings may be taken without disturbing the thermometer. Drop several drops of water on the thermometer bulb, and freeze it to the shelf. Unless good contact is secured in this manner, and unless the coils are frosted, the readings are very likely to be false. Short-out the thermostat, as described under thermostat adjustments, close the food compartment door, opening only when taking readings, and permit the machine to run about six minutes, when the first reading may be taken. Continue to take readings at intervals of approximately five minutes until the temperature has become constant, or has dropped below two degrees, making the necessary adjustments to obtain this temperature.

With a correctly adjusted valve, the temperature will remain constant at some point around two to six degrees. The lower temperature is preferable for the smallest evaporators, and the higher temperature for the largest. These temperatures apply to Models, J, K, L, and M only. Next, using the

frozen-in thermometer, check, the cutting-in point of the thermostat by putting the thermostat back in the circuit, and waiting for the unit to start. With the cold control on No. 5 position, the unit should cut-in before the frost begins to melt off the evaporator. The cut-in temperature should be about 28 to 25 degrees. A cutting-in temperature below this point may make the unit start earlier, and run longer than is necessary. Cutting-in above this temperature will cause defrosting and formation of ice on the evaporator. If the cutting-in temperature is several degrees off, adjust thermostat as explained under adjustment of thermostats. If the expansion valve leaks slightly during the idle period, the thermometer reading may be effected, giving a false indication. Always observe the condition of the frost on the evaporator when checking the cut-in point. With the cold control set at the coldest position, check the cutting-out point of the thermostat. The machine should cut-out as soon as a light coat of frost appears on the suction line loop, or on the suction line a few inches above the lid. If no frost appears at this point when the machine stops, open the expansion valve slightly, depending on how near the frost is to coming through the lid. If excessive frost forms on the suction line, close the expansion valve, being careful not to overadjust. This valve should not be adjusted below two degrees constant pressure, since lower temperatures will decrease the capacity of the machine. Higher constant pressures than six degrees are all right if the machine cuts-out on the coldest position without excessive frost on the suction line. The temperature at the cutting-out point is of no importance. To sum up, the expansion valve and thermostat adjustment must be checked together. Set the expansion valve within its proper limits, two to six degrees first, then check in the cutting-in point of the thermostat from 28 to 25 degrees, and then check cutting-out point by observing the frost above the lid.

All Adjustments Should Be Observed Before Making Changes

Complaints are very often misleading, and it is, therefore, necessary to make a complete check of adjustments and symptoms before arriving at a conclusion. For instance, should the complaint be "Evaporator defrosting"—the thermostat might be assumed to be out of adjustment, and changed accordingly to lower the cut-in temperature. This change might result in excessive frost on the suction line and excessive running. If all adjustments had been observed first, however, the expansion valve and cut-out point found correct, while the cut-in point was too high, then the proper conclusion would be drawn that the thermostat was going dead or losing its charge. A replacement would then be made at once, and considerable time saved by avoiding the misadjustment.

If the complaint had been "Unit runs too much and cabinet too cold"—the proper diagnosis might result in the following observations and corrections:

Expansion valve constant temperature —12 degrees

Thermostat cut-in at No. 5 position—20 degress

Heavy frost on suction line and unit does not cut-out on the coldest position.

Here the thermostat and expansion valve are both slightly out of adjustment. The expansion valve should be adjusted to a constant temperature of about four degrees and the thermostat adjusted to a cut-in temperature of about 24 degrees to correct the trouble. When the thermostat and expansion valve are properly adjusted, the cabinet temperature and running time will again become normal, provided there is no other cause of improper operation. The corrections for each case must be reasoned out after all adjustments and conditions have been observed.

Additional Service Problems

Careful checking of adjustments of the thermostat and expansion valve will usually disclose almost any defect or improper condition present in the unit. Most important of these, which may be identified, are as follows:

Short of Refrigerant. When, after the expansion valve has been adjusted properly, the unit takes an unusually long time to shut off, examine the coils and suction line for frost. If the frost covers the coils and extends along the suction line above the lid, there is plenty of refrigerant, and the reason for continuous running will be in the thermostat, or sensitive bulb contact. If there is no frost on the suction line after a reasonable running period, giving due consideration to the room temperature, the food load and previous operation of the unit, flush the expansion valve. If there is sufficient refrigerant, a rush of liquid may be heard, passing through the valve. The suction line above the lid will become cold, and if the valve will flush sufficiently, the com-

pressor will become noisy, due to liquid refrigerant displacing the oil. If there is a shortage of refrigerant, none of the above symptoms will be evident, and only a slight hissing sound will be heard as gaseous, not liquid, refrigerant passes through the valve when it is flushed.

Check Valve Leak. If the check valve is leaking, the hot gas from the compressor backs down the suction line into the separator, or accumulator tank, and into the evaporator, where it warms up the sensitive bulb of the thermostat and causes the unit to start again after a very short idle period. Since only a part of the evaporator is warmed up, the running period will also be very short. By placing the hand on the suction line when the unit stops, the line can sometimes be felt to warm up rapidly. Usually the gas may be heard blowing back past the check valve. The tail end of the evaporator coil sometimes defrosts, and the cut-in temperature reading will be false. When operating with a check valve leak, it may be necessary to turn the switch off for a time, to prevent the cabinet from getting too cold.

Displaced Oil. Should a large amount of oil leave the compressor and become trapped in another part of the system, a pronounced clicking noise will be heard in the compressor, due to the blades being insufficiently lubricated. This noise will be continuous during the running time of the cycle. To check for this condition, raise the condenser end of the unit, and if the noise diminishes, as the condenser is raised, there is a shortage of oil in the compressor. Displaced oil may be returned to the compressor by passing it around through the system. This is accomplished by running the unit several minutes to pump out the evaporator. Then, with the unit running, open the expansion valve fully by turning the adjustment screw clockwise as far as it will go. Let the unit run two or three minutes in order to dump all the contents of the receiver into the evaporator. Next, turn the adjusting screw counter-clockwise as far as it will go, completely closing the valve. Then, keep the unit running until the evaporator is again pumped out. When the contents of the receiver are dumped, liquid refrigerant will, of course, be pulled into the compressor, increasing the blade noise. The compressor may get tight and cause the overload to trip. Keep resetting this overload to make the unit run, but do not short-out the thermostat. It may be necessary to raise the compressor end of the unit a few inches, in order to keep the unit running until the evaporator is pumped out. Within about 30 minutes, the unit will again operate normally. The oil having been returned to the compressor, the blade noise will be gone, and the expansion valve can be readjusted.

Compressor Stuck. Sufficient moisture entering the system, combines with the refrigerant to produce an acid, which will corrode the iron and steel parts of the pump, and eventually cause the compressor to freeze tight. If the unit cannot be kept running, it must be replaced or rebuilt, thoroughly cleaning the system all the way through.

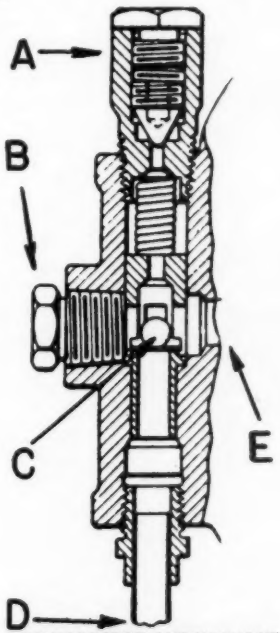


FIG. 3.—THE COLDSPOT CHECK VALVE AND CHARGING CONNECTION
A. Charging Connection
B. Discharge Plug
C. Check Valve
D. Suction Line Connection
E. Opening to Compressor

Expansion Valve Stuck. An expansion valve may occasionally stick in an open or closed position. When open, an excess of refrigerant will pass through, which may cause blade noise, or a tight compressor, and the frost may melt from the coils. If stuck in the closed position, the frost will tend to melt from the coils; and in both cases, continuous running may result. Flushing the

valve will usually overcome this trouble.

Flushing the Expansion Valve. Run the unit several minutes, with the adjusting screw turned counter-clockwise, closing the valve. Then, with the unit running, turn the screw clockwise all the way in, and immediately back it out and readjust the valve.

Gas Leaks. Location of gas leaks may be determined in the usual manner with an ammonia swab, which should be passed over all joints and connections in the system. If the leak is very small, it is sometimes necessary to use oil on the suspected joint in order to locate the leak definitely.

Discharging the Unit. If a unit is leaking so badly as to be a nuisance, remove the discharge plug (see Fig. 3) and allow the charge to escape. This, of course, must be done outside of the building and away from growing plants. Keep your face away from the plug, so that flying particles will not strike the eyes.

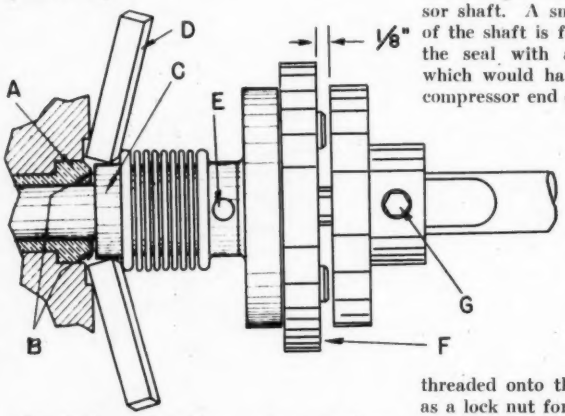


FIG. 7.—SEAL AND DRIVE COUPLING ASSEMBLY

A. Compressor Bearing and Seal Seat
B. Running Surface of Seal
C. Steel Seal Nose
D. Wood Pry
E. Hole for Spanner Wrench
F. Drive Coupling Washer
G. Set Screw

Oil Leaks will seldom occur anywhere but at the seal. It is possible for the seal to leak oil and not gas. The rubbing surface must be lubricated, and it is only reasonable to expect that some oil will seep out on to the front of the compressor. If the leak is excessive, and cannot be stopped as explained in the following pragraph, the unit must be removed for repairs or replacement. Do not, however, mistake oil from the motor for oil from the compressor.

Flushing the Seal has been found effective in stopping oil and gas leaks. Stop the unit, then with two thin pieces of wood ⅛-inch thick and one-inch wide, pry the seal button off its seat, as shown in Fig. 7, allowing gas and oil to blow out for an instant. Open the expansion valve so that a pressure of upwards to 10 lbs. may be obtained on the seal, and allow to run approximately 20 minutes. Flush the seal in this manner several times so as to wash off any foreign material that may have collected there. Then wipe the escaped oil off the parts, start the motor, and allow the seal to run in. A check should be made the following day to determine if the leak has entirely stopped. Repeated flushings will usually cure some very bad oil and gas leaks. Be very careful not to damage the copper bellows.

As will be noted in Fig. 7, the main bearing of the compressor also serves as the stationary face against which the seal rotates. This bearing is of a special alloy, such as bronze and lead, or a similar combination. Any attempt to replace it with other metals will, no doubt, meet with considerable trouble. The seal is of the copper bellows type with a steel nose. This seal is threaded with a right-hand thread onto the compressor shaft. A small hole in the outer collar of the shaft is for the purpose of removing the seal with a special spanner wrench, which would have to be made to fit. The compressor end of the drive coupling is also threaded onto the compressor shaft, acting as a lock nut for the seal.

Seal leaks that do not succumb to the flushing, as described in the foregoing, are probably due to a worn bearing in either the compressor or motor. To test, try for side or up-and-down motion. If any motion can be felt, the seal will most likely leak, and the bearings will have to be replaced, and the seal reground.

Motor and Compressor Run Hot. In extreme temperatures, the motor and compressor may get quite hot. If the motor continues to run, it is probably a normal condition, otherwise, the safety cut-out would have functioned. However, be sure the condenser is clean, and the motor properly oiled, as either insufficient air or dry motor bearings will cause overheating. A short circuit in the motor windings will also cause

overheating of the motor. Replace or repair only the motor in this case.

Overload Trips Frequently. Check for a dirty condenser, dry motor bearings, low voltage or electrical disturbance, tight or stuck compressor, or defective motor. Also, check the rating of the thermostat with that of the motor.

Eleventh Article

Air Conditioning

Servicing the Carrier Model 50F, Continued from the April Issue

By W. C. FARMINGDALE

IN the April issue we discussed what parts to check and how to check them at pump down time. We discussed the four items:

1. Sufficient refrigerant
2. All joints for leaks
3. Sufficient oil in compressor
4. Discharge valves.

Let us continue on along this vein and discuss:

1. How to check the suction (piston) valves
2. Brushes on d.c. compressors and fan motors
3. Belt tension
4. Filter
5. Primary air fan
6. Expansion valve and liquid line strainer
7. Fins on the condenser for dirt.

How to Check the Piston Valves

The piston valves are important parts of any compressor. If these valves are damaged or if they seat improperly the compressor efficiency will be seriously impaired and the cooling capacity of the whole system will be greatly reduced.

In the model 50F, the piston valves are two flat discs. Each disc is held in place by three small coil springs. The coil springs are held in position by a valve cage that is secured to the top of the piston by a machine screw. The valve cage has three recesses which retain the springs. In case the piston valves are removed for inspection or for replacement, take care that you set the three coil springs on the valve discs in such a way that the springs will go up into the recesses. If they don't go into the recesses, the valve will be jammed closed and the piston will not pump.

To check the piston valves, install a head gage on the compressor and run both the head valve and the suction valve all the way in, and start the compressor. If the piston valves are o.k., the back pressure will drop about 5 pounds when the head pressure is about 90 pounds. If the piston valves are leaking, the back pressure will not drop because gas from the cylinder will be leaking back into the low side of the system through the piston valves. Of course, when this test is made it is assumed that the discharge valves have already been tested and found to be o.k.

Replacing Piston Valves

If the piston valves test defective they can readily be replaced. To do this run the suction valve all the way in, pump down the compressor body, and then close the head valve. Now remove the cap screws from the compressor head, remove the discharge valve plate and the cylinder head spacer. The piston valves can now be removed by loosening the screw in the center of the valve cage and removing the valve cage. When doing this be careful not to drop the three small coil springs that hold the valve in place. Before replacing the valve discs, wipe the valve seats with a clean rag and examine them for scratches with a strong flash light and mirror. If no scratches are found install the new valve discs. However, if the valve seats are scratched, the compressor must be removed from the cabinet and the seats lapped in before the new discs can be installed.

Note: When reassembling the compressor head, be sure to use three new gaskets: one between the cylinder block and the spacer, one between the spacer and the discharge valve plate and one between the discharge valve plate and the compressor head.

Checking Brushes on D.C. Machines

All d.c. motors have carbon brushes which ride on the motor commutator all the time that the motor is operating. As a result of this continued sliding contact brushes wear and must be replaced. Hence, it is important that the serviceman check all brushes on any service call. On the model 50F there are four brushes to check, two on the fan motor and two on the compressor motor. The brushes on the fan motor are located behind two Bakelite caps near the rear of the motor. One of these brushes is at the front of the unit whereas the other is at the rear of the unit. The two brushes on the compressor motor are located behind handhole covers at the rear of the motor. On the 1936 model 50F, a starting box is used. This must be removed in order to get at the compressor motor. When short brushes are found they should be replaced in order to avoid future service calls.

Belt Tension

When the belts are properly adjusted a slight pressure from your first finger should depress the belts about one-half inch. If the belts can be depressed more than this they are too loose. This may cause them to slip and in extreme cases to burn out. Burned belts will cause a burning rubber smell which will be drawn up into the conditioner through the primary air circuit passed over the cooling coil and circulated through the room. This unpleasant odor will last several days so you can see why it is extremely important on this particular unit to prevent belts from burning out.

On the other hand, if the belts are too tight, the compressor motor may be overloaded. If this happens, the overload protector which is built into the on and off switch will keep jumping out and stopping the machine.

The belts on the model 50F can be adjusted by raising or lowering the compressor body on the two front adjusting bolts which hold it to the motor assembly. Raising the compressor tightens the belt, whereas lowering the compressor loosens the belt.

Filter

The filter used in the model 50F is made of spun glass and is the non-cleanable type; that is, when the filter gets dirty, it shouldn't be cleaned; it should be discarded. New filters can be obtained from Owens-Illinois Glass Company.

When the filter is dirty, air cannot enter the primary air fan readily and as a result the flow of room air into the unit is greatly decreased. When this happens, the cooling capacity of the unit is lowered and little or no room cooling takes place. Oftentimes the cooling coil will completely frost up because insufficient warm air is brought into the cooling coil to keep it above a frosted condition.

Under no circumstances should a model 50F be operated without a filter because dirt may get into the primary air nozzles and stop them up, thus preventing the unit from drawing in room air.

Primary Air Fan

The primary air fan is made up of a flat disc to which flat blades are spot-welded.

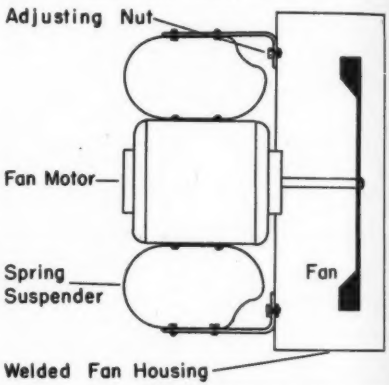
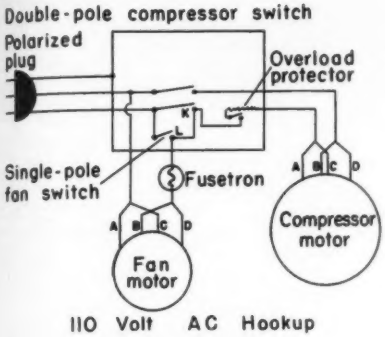
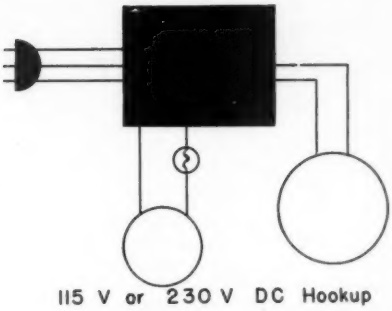


FIG. 1.—FAN MOTOR ASSEMBLY SHOWING ADJUSTING NUTS FOR CENTERING FAN IN ITS HOUSING

The primary air fan cannot be removed from its casing because the casing is welded after the fan is assembled. Occasionally one of the fan blades will break away from the disc and so cause noise and vibration. This can often be repaired by removing the entire fan assembly from the conditioner, thoroughly cleaning the disc and the blade with acid and then sweating the blade into place on the disc with a heavy soldering copper. This operation can be performed through the large discharge opening at the top.

Sometimes the primary air fan will strike its scrolls when either the motor starts or stops. This happens because the primary fan motor is suspended by two spring steel suspenders. As the motor starts or stops, the suspenders allow the motor to tip from side to side and so allow the fan to hit the scrolls. To overcome this noise, re-center the





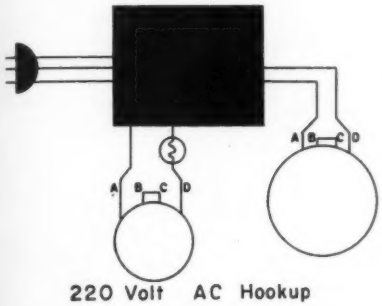


FIG. 2.—WIRING DIAGRAMS FOR MODEL 50F AIR CONDITIONER

Note the Jumper (K-L) between the compressor switch and the fan switch. When the compressor switch is on the fan motor gets current even if the fan switch is off.

fan in its scroll by loosening the adjusting screws shown in figure 1.

Expansion Valve and Liquid Line Strainers

Two strainers are used in the liquid line of the model 50F to prevent dirt from getting to the seat of the expansion valve. These strainers are both located on top of the unit at the expansion valve. The liquid line strainer is in a large brass tube whereas the expansion valve strainer is located behind the 3/8 inch flare nut on the expansion valve.

Before the strainers can be cleaned, the system must be pumped down. To do this, run the liquid line shut-off valve all the way in. This valve is on top of the cabinet near the expansion valve. Then start the compressor and allow it to run until the back pressure drops to about five pounds. Then stop the compressor, remove the strainers and wash them in carbon tetrachloride. Dry them thoroughly before reinstalling them in place. When you remove the expansion valve strainer, take care not to lose the copper washer which fits behind the strainer to form a gas tight connection between the strainer and the valve body.

Dirt on the Condenser

Since the air drawn in over the condenser is not filtered, dust and dirt is bound to collect on the condenser. As a result after one season's operation the condenser must be thoroughly cleaned. If this is not done, the dust and dirt on the condenser will act like an insulator and prevent the condenser from throwing off its heat. As a result the head pressure on the machine will build up and the cooling capacity will go down.

The condenser should be cleaned with a stiff long bristled brush to loosen all dirt. Then the front should be installed on the unit before the compressor is started. If this is not done, all the dirt that was loosened will blow into the room. After cleaning the condenser, it is good practice to clean out the condensate pan under the condenser to eliminate any possibility of odors, particularly tobacco odors. This can be done by scrubbing the pan with a scrub brush and a hot solution of household Oakite.

Checking Operation

When you want to check the overall operation of the model 50F, gages cannot be installed right at the head on suction side of the compressor. This is so because the front of the unit must be installed while the gages are being read. If the front of the unit were removed, the path of air through the unit would be interfered with because the condenser fan would draw comparatively cool room air through the condenser rather than the relatively hot outside air. Hence, the overall operation of the unit

cannot be checked with the front of the cabinet removed.

The gages must be installed through the filter door on top of the unit. This is done by removing the front of the unit and fishing the two gage lines down through the filter door to the compressor. After the lines are connected to the compressor, the front of the unit must be reinstalled before the compressor is started.

Noise Complaints

The model 50F is carefully designed, sturdily built and well insulated so that in normal operation the unit is very quiet while running. However, occasionally noises develop that servicemen are called in to eliminate. Following is a list of sources of noise:

1. *Shipping locks not removed.* The model 50F has 5 shipping locks which must be removed before the unit is started up. If these aren't removed neither the compressor nor the fan motor will ride on their springs and very noisy operation is sure to occur. The shipping locks on the compressor are located under the four spring mountings of the compressor. When the through bolts of the spring mountings are run down, the compressor is locked hard on the chassis. The lock nuts should be run down and the three bolts turned until the full weight of the compressor rests on the springs and the compressor fan does not strike its scroll when the motor starts and stops. Then the chassis should be locked in place with the lock nut.

The lock nut on the primary air fan is located under the fan motor. This should be run all the way down so that the primary air fan floats on its suspension.

2. *Scraping noise when the unit starts and stops.* Either the primary air fan or the condenser air fan is striking its scroll.

Adjust the primary air fan motor as shown in Fig. 1.

Adjust the spring suspension on the compressor motor as described above. If this does not eliminate the noise, remove the triangular plate in front of the condenser and adjust the fan scroll for the condenser fan. *Note:* Don't move the condenser fan away from its scroll to eliminate this noise because as was pointed out in a previous article of this series, the cooling capacity of the unit is reduced when the fan is moved away from its scroll.

3. *Squeaking noise on D.C. motors.* Hold a commutator stone against the commutator on the compressor motor until the commutator becomes shiny.

Remove the brushes from the primary fan motor and wipe them dry of any oil.

Complaint of Little or No Cooling

Check to see that the overload protector (in the on and off switch) is in and that the compressor operates. Examine the cooling coil. If it is covered with frost something is wrong with the primary air circuit. Either the fan motor is not operating properly (a.c. motor connected for 220 volts but used on 110 volts; d.c. fan motor stopped because of short brushes or blown fusetron) or the filter is stopped up thus preventing air from passing through the unit.

If only part of the coil is sweating, listen at the expansion valve for a hissing noise. If expansion valve hisses, the unit is short of refrigerant.

If only part of the coil sweats and the unit is not short of refrigerant (checked by liquid level indicator) examine the liquid line and expansion valve strainers for stoppage. If these are clear, replace the expansion valve.

If the entire coil is cold but does not sweat, or if it sweats slightly, check for bad piston and discharge valves at the compressor. Check also for a dirt-stopped condenser and for air in the system.

If the overload keeps kicking out, check for a closed window where the unit is installed. Check for an overcharge of refrigerant and for a dirty condenser.

If the machine checks o.k., look around the room for open doors, windows, or transoms, for sun light streaming in through unshaded windows, for a large number of occupants in the room, for a large number of electric lights turned on and for any other source of large quantities of heat.

Joe Aigner
New York

I would like to take this opportunity to add my praise of the magazine, and I certainly enjoy reading the excellent articles appearing in this journal. I recommend the R. S. E. to anyone who may be interested in this valuable publication. My sincere wishes for success in publishing the wonderful items in the R. S. E. magazine.

Felix R. Wierman
Wisconsin

The SERVICE ENGINEER is a great book, with a carload of worthwhile information in every issue. I certainly look forward to the coming of each issue.

Operation of the Thermostatic Expansion Valve

By GEO. H. CLARK *

THE operation of a refrigerating system making use of an automatic expansion valve may be compared to a water-pumping system as in Fig. 1.

A is pictured as being a tank of water. B is pictured as being a lower tank into which water from A runs. P is a pump which pumps the water from B to C as fast as it runs from A to B. C has a level 110 feet above ground level, while the level in B is at the 0 level.

This is directly comparable to a refrigerating system where A is a brine tank having heat in it to give temperatures corresponding to the various levels indicated. B

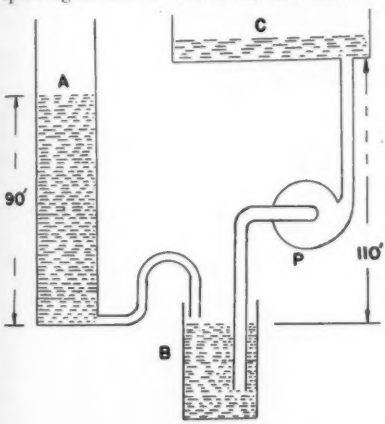


Fig. 1

is the evaporating refrigerant in the evaporator at a 0 degree level or temperature. P is the refrigerating system pumping heat from B to C, which is the condenser. The condenser then passes the heat to the atmosphere which may have a 90 degree level.

In a water pump system the water level in A would be reduced as the pump operated to pump the water to C. In a heat system the temperature of A is reduced as heat is pumped from B into C. The evaporator corresponds to the pipe which regulates the flow from A to B.

* Refrigeration Engineer—Detroit Lubricator Co.

It would be very evident in a water pumping system that to remove a definite quantity of water from A to C more energy would be required with the system shown than with one in which the level in B was maintained a fixed distance below the level in A.

Suppose there are 10 pounds of water per foot of depth in tank A. To start with it is filled to the 90 foot level or has 900 pounds of water in it. To lower the water level to 10 feet will require the removal of 90-10 or 80 pounds of water. This water is picked up by the pump at a 0 foot level and raised to the 110 foot level. The amount of work done then is 80 pounds $\times$ 110 feet $=$ 8800 foot pounds.

On the other hand, suppose the pump picked up the first part of the water from B at an 80 foot level and the last part at the 0 foot level. The average level at which the water is picked up then is 40 feet. The work done in moving 80 pounds of water from an average level of 40 feet to 110 feet is $80 \times (110\text{-}40) = 5600$ foot pounds.

It will be noted that in the above cases the work done is changed from 8800 to 5600 foot pounds by means of picking up the water from a level just 10 feet below the level in A instead of at a constant level of 0.

In the same way the energy required to move heat from an average level of 40 degrees to a 110 degrees level is considerably less than required to remove it from a 0 degree level to the 110 degree level.

This gives one of the reasons for the development of the thermostatic expansion valve. Fig. 2 shows a brine tank evaporator, for illustrative purposes, with an automatic expansion valve in use. In this case if the expansion valve was set for four pounds gage we would evaporate methyl chloride in the coil at 0 degrees. If the condensing temperature was 110 degrees we would have conditions as described above with a 0 degree temperature where our heat is picked up.

In order to pick up our heat at a higher temperature we could set our automatic expansion valve to maintain a high refrigeration temperature such as 80 degrees. When

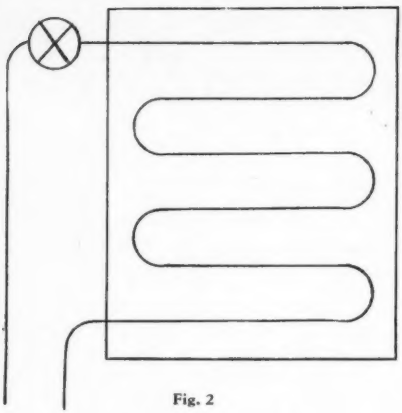


Fig. 2

our brine is reduced to a temperature a little below 90 degrees the difference between the brine and refrigerant temperatures is so low that the heat cannot be exchanged fast enough and liquid will return through the suction line. An operator with his hand on the suction line would "feel" the liquid passing through and could readjust the valve to give a lower evaporator pressure such as to give 70 degrees refrigeration.

The first action of the valve would be to close tight. It would stay closed tight until some of the refrigerant had evaporated, and the suction pressure was reduced to the new operating pressure. The valve would meter refrigerant through then until the brine was reduced to such a low temperature that the suction line again became flooded, when the operator would reset for lower pressures. This action would be repeated until the suction pressure had reached 4 pounds gage and a frost-back starts to occur. A readjustment of the valve would tend to lower the pressure below 4 pounds. We could, if we desired, connect a pressure operated motor switch into the suction line, and if this switch was set to open when the pressure was reduced below 4 pounds gage we would in effect have a temperature control with the temperature of the refrigerant in the evaporator serving as the charge for the control.

The thermostatic expansion valve is really just an automatic expansion valve with a thermal adjustment to take the place of the adjusting spring.

In Fig. 3 if the bulb was at any temperature, say 30 degrees, the valve would thermostatically be adjusted to regulate the pressure into the coil so as to give a 20 degree evaporating temperature. The refrigerant would enter as a liquid and vapor. Approximately 15 per cent of the liquid would flash into gas as it passed through the valve. The latent heat to flash this percentage into gas would come from the refrigerant itself, thereby reducing its temperature from the incoming liquid temperature to 20 degrees. As the refrigerant passes through the coil more and more of the liquid will be vaporized until at point A the refrigerant is a saturated vapor at a temperature of 20 degrees. As it passes through the remainder of the coil and into the suction line it picks up more heat. If the gas was at 20 degrees, the boiling temperature at the pressure existing in the coil, and it warmed up to 25 degrees at B, we would say that it had 5 degrees of superheat at B. If the gas should warm up to 27 degrees at the point where the bulb is clamped on the line it would then have 7 degrees of superheat.

The bulb itself is affected by the temperature of the gas in the tube and the air around

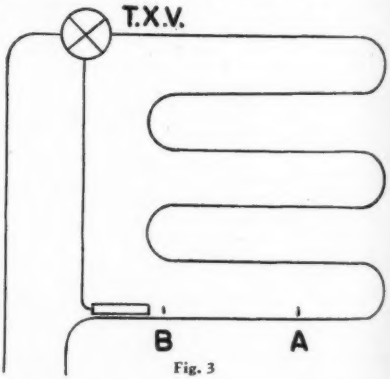


Fig. 3

the bulb so its temperature may be about 3 degrees above the temperature of the gas in the tube or is at a temperature of 30 degrees.

For convenience in setting valves we refer to a superheat setting. We take this as being the difference between the bulb temperature and the evaporating temperature corresponding to the outlet pressure of the valve. In this way we assume no temperature difference between the bulb and gas in the line and no temperature lag between the bulb and gas. These conditions, of course, do not occur, but this method of specifying a setting proves very satisfactory.

Actually the superheat setting allows for temperature lag and the temperature difference between bulb and gas which does obtain.

In Fig. 3 if the valve should feed refrigerant into the coil faster than it evaporates it will flood through the coil until the refrigerant just reaches its saturated condition at 20 degrees at B. In this case the thermal bulb will be chilled below 30 degrees. This in turn will readjust the valve for operation at a lower pressure. This in turn produces a lower refrigerant temperature in the coil so the refrigerant can pick up heat enough to evaporate it completely by the time it reaches A.

As the temperature around the coil decreases (ambient temperature) the capacity of the coil to pick up heat with the same evaporation temperature is reduced, so the refrigerant tends to flood through to B again, causing a further readjustment of the valve. In this way the valve tends to keep the coil flooded with refrigerant.

In keeping the coil completely refrigerated we are keeping it filled with refrigerant at the highest back pressure possible without flooding into the suction line. This means that we are evaporating at the highest possible refrigerating temperature and thereby getting the most efficient pick up of heat and thereby reducing the energy required to pump the heat from the pick-up temperature to the condensing temperature to a minimum.

In addition to this we increase the capacity of a refrigerating machine considerably by the increase in suction pressure.

If our machine is taking in gas at a 10 pounds gage suction pressure the volume of the cylinder above the piston at the bottom of its stroke should be filled with gas at this pressure. Taking our atmosphere as 15 pounds absolute our absolute pressure in the cylinder would be 10 + 15 or 25 pounds per square inch absolute. If we doubled this absolute pressure to 50 pounds per square inch absolute we would double the quantity of gas in the cylinder before compression and thereby double the rate at which refrigerant circulated through the system and moved heat. The gage pressure then would be 50 — 15 = 35 pounds per square inch.

Actually laboratory tests show that the capacity of a refrigerating machine increases slightly faster than the absolute suction pressure. In other words, if we double the absolute suction pressure, in general we more than double the capacity of the machine.

The thermostatic expansion valve being an automatic valve with a thermal adjustment acts like the automatic valve in closing off when the refrigerating machine stops.

The thermostatic expansion valve then, like the automatic valve, has two purposes. The thermostatic valve in normal use should keep the coil completely refrigerated while the machine is in operation and close off when the machine stops.

The thermostatic valve to perform its duties must have the cooperation of the refrigerating system in that the system must have enough refrigerant in the system and the valve must be properly installed.

S S S

SERVICE TIP

By A. E. JOHANSEN

FOR those who use Prest-O-Lite tanks in their service work and have trouble in keeping the flame adjusted, here is a worthwhile tip.

An old automatic expansion valve makes a fine pressure reducing and regulating valve when used as shown in Fig. 1. To connect, use a piece of ⅜-inch brass rod about one inch long with a small hole drilled through it. Solder this into the inlet of the valve. Drill the tank, fitting ⅜-inch and solder the other end of the brass rod in it, and the valve can now be attached to the tank.

Solder, or connect with a flare, the hose tank connection to the valve outlet, and you have a perfect regulation of gas pressure.

The Servel Balanced Seal

By P. B. REED *

NO one device has contributed more to the success of the automatic electric refrigerating machine than the shaft seal. Without a seal not requiring frequent "taking up" as was the case with the packing gland, electric refrigeration as we know it today would not have been possible. Although the hermetically sealed system has been widely used, the conventional type employing a shaft seal continues to be far more popular, especially in commercial and air conditioning sizes, due to the ease with which it can be serviced in the field.

A number of types of shaft seals have been developed with various degrees of successful, dependable operation but even among the better seals, there are marked differences in how long they will last before they must be relapped or replaced, the ease with which this can be done and the amount of friction between their sealing surfaces which in turn requires extra wattage to be consumed by the motor. Most seals are the "spring loaded" type, in which the sealing surfaces are held tightly together by the pressure of a heavy spring—heavy enough to counteract the crankcase pressure which may be 70 or 80 pounds per square inch.

The Servel seal is a truly "balanced" seal, so termed because it is designed so that the crankcase pressure itself provides the pressure that holds the sealing surfaces together. Consequently, the seating and unseating effects are always in balance regardless of whether the crankcase pressure is 2 or 100 pounds per square inch. However, the design is such that the seating effect is just slightly more than the unseating effect so that although the seal does not leak, the sealing surfaces are running together only lightly and as a result the wear is negligible, the seal will last indefinitely and only a fraction of the wattage is required that would be if the sealing surfaces were pressed hard against one another by fixed heavy spring pressure.

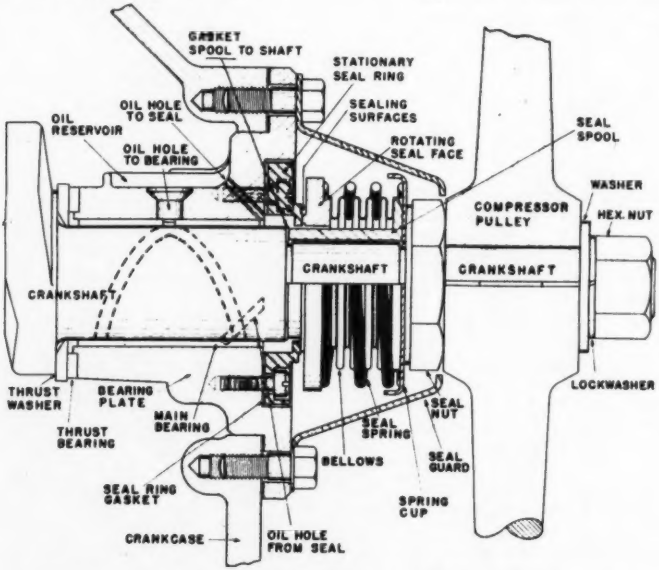


FIG. 1.—Cross Sectional View of the Servel Seal.

The construction of the patented Servel balanced seal is illustrated in Fig. 1 from which it will be seen that it consists of two main parts: the hardened, ground and

* Service Manager, Servel, Inc., Evansville, Ind.

lapped stationary steel seal ring which is gasketed to the bearing plate and secured by means of countersunk fillister head machine screws; and the bellows seal, which itself consists of the spool, gasketed to and held tightly against the shoulder of the shaft by means of the seal nut, the metal bellows, and the seal face of special low-friction metal which is lapped flat. The seal face and the seal ring are the sealing surfaces.

Crankcase pressure has free access to the seal by means of the two oil holes and along the shaft. Crankcase pressure tends to push the seal face away from the seal ring, but also exerts a pressure inside the bellows tending to lengthen it and thus keep the seal face up against the seal ring. By properly proportioning the size of the seal face and the bellows, the seating pressure is caused to be just slightly more than the unseating pressure and this difference is just enough to keep the seal face pressed lightly against the seal ring and since both sealing surfaces are lapped flat the refrigerant gas cannot escape.

This same balancing effect holds true regardless of the amount of crankcase pressure. On an actual test with five hundred pounds per square inch pressure in the crankcase, the seal did not leak. All Servel compressors are production tested at 250 pounds per square inch.

When the compressor crankcase is on a vacuum; that is, below atmospheric pressure, the crankcase pressure exerted on the inside of the bellows tending to seat the seal face on the seal ring is not great enough to overcome atmospheric pressure on the outside of the bellows that tends to collapse the bellows and unseat the seal face from the seal ring. It is, therefore, necessary to supplement crankcase pressure with a light spring. This spring would not, however, be necessary if the compressor were never operated on a vacuum and the seal would hold tightly without the spring. This has been demonstrated by operating the compressor without a seal spring at suction pressures of 5, 10, 50, 100, 200 and 300 pounds per square inch and the seal held perfectly.

The sealing surfaces are kept lubricated and the seal cooled by oil from the crankcase. This oil comes to the seal through the upper oil hole and leaves the seal through the lower hole. The oil outlet is set slightly above the bottom of the inner curve of the seal ring so that a small amount of oil is

FIG. 2.—LAPPING THE SEAL RING. Showing the method of holding the ring while lapping with a figure of eight motion and rotating at intervals.

trapped there, thus assuring lubrication of the seal at all times.

The efficacy of a seal depends on the "perfect" fit of the seal face against the seal ring—a perfect fit not only in one position but in all possible positions, rotating and stationary. For this to be true both surfaces must be as nearly perfectly flat as it is possible to make them and of mirror-like smoothness.

The steel seal ring is made of oil-hardening tool steel, machined to the shape shown in Fig. 1. This skeleton type shape is designed to prevent distortion of the sealing surface of the seal ring when the screws securing it to the crankcase are tightened.

The ring is held as shown in Fig. 2 and moved lightly but firmly in a figure-eight motion and occasionally rotated. After the seal ring appears to the eye to be lapped it is washed in clean naphtha and inspected under a binocular microscope for possible pitted or rough spots. It is then examined for flatness by means of an optional flat under polarized light. This will show an "out of flat" condition as slight as four millionths of an inch and so accurate is the lapping that over 98 percent of the rings pass this test.

The seal face is a ring of special alloy metal consisting of bronze into which lead in small particles has been fused. After being

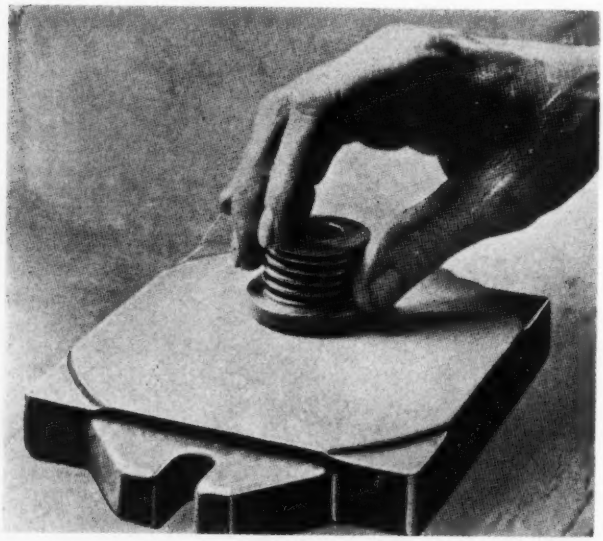


FIG. 3.—LAPPING THE BELLOWS SEAL RING.

Showing the method of holding the bellows while lapping. The same motion is used as on the steel ring, but a different lapping block should be used.

Even with this construction, the screws should be tightened gradually. After the seal ring is machined, it is hardened and drawn to make it hard yet tough. The ring is then put in a surface grinder where it is held by a magnetic chuck and the sealing surface ground flat and smooth. It is then ready for lapping.

The fine finish is obtained by hand lapping of the ground surface against a lapping block which is a plate of cast-iron one side of which has been ground flat by a surface grinder and match-lapped against a similar block. In lapping the seal ring against the block a thin coating of a fine abrasive (No. 303 Emery) and Servel white oil is used.

machined it is soldered into the bellows which has been previously soldered to the spool. The entire assembly (known as the bellows seal assembly) is then tested for leaks. The bellows seal assembly is held as shown in Fig. 3 and the seal face is lapped on another lapping block so that there will be no chance of iron particles or abrasive being ground into the bronze-lead face. A thin film of oil and rottenstone is used to give a light abrasive and polishing action. After the seal face appears to be smooth it is carefully washed in clean naphtha and examined under the microscope for pitted spots, coarse granular structure, hard spots or large lead particles. To assure uniform-

ity of the metal, a micro-photograph showing the metallic structure is taken of each shipment of this bronze-lead metal received from the manufacturer and as a result but few rejections of the lapped and finished seal face are necessary.

Servel seals are accurately and painstakingly made and will last indefinitely without any care. The oil level in the compressor should be up to the crankshaft as all seals require some lubrication. Also care should be taken against the entrance of dirt, scale or other foreign matter into the oil as it may find its way to the seal and, working into the sealing surfaces, score them. Unless they are too badly cut they can be relapped in the field.

Relapping the seal ring or seal face can be done in the field by using the same methods employed in the factory, as described above. To avoid possible distortion of the seal ring in reattaching it to the compressor, it is preferable to remove the bearing plate and lap the seal ring surface by moving the entire bearing plate in the same manner described for the seal ring only. Never attempt to lap the seal face directly against the seal ring.

Some types of Servel compressors use, instead of a stationary steel seal ring, a bronze-lead ring which is the end of the main bearing and in this type the rotating seal face on the bellows is steel. The end of the bearing must be lapped after it is inserted in the compressor crankcase and reamed. It is entirely practical to lap this bearing end by holding the crankcase and lapping the bearing end against the block in the same manner described for the seal ring.

The condition of the lapping blocks is very important. They wear out-of-flat and must be reground on a surface grinder. Three lapping blocks should be kept in the service shop, one for lapping the steel rings, one for the bronze-lead members and one as a master block by which to check the other two (using mechanic's blue in the usual manner to show the high and low portions.) When a block needs resurfacing it can be sent to the factory and the master block used in its place. The reground block when returned from the factory then becomes the master block.

If, in an emergency, lapping blocks are not available, a clean piece of *new* plate glass makes a good substitute, but should not be used more than a few times without checking with a master block.

Always carefully wash lapping blocks after use and protect them against rusting with a light coating of unmedicated vaseline.

The Servel seal is dependable. Since its sealing surfaces run lightly together, it does not require periodic replacement or relapping. It requires but a few watts of current to operate it. This type of seal has been used on Servel compressors for over twelve years and the soundness of the design is demonstrated by the fact that although construction improvements have been made, it has not been necessary to make any changes in its basic design in all that time.

S S S

MILK COOLING AT CHESTERBROOK DAIRIES

BACTERIA counts as low as 200 are reported by the famous Chesterbrook Dairies of Berwyn, Pa., since the installation of a modern refrigeration system for milk cooling and dairy product storage.

Peter J. Boland, manager of the dairies, said that since the installation of Carrier refrigeration "samples of the milk are taken several times each month for analysis by the Dairy Laboratories, Philadelphia." With few exceptions, he stated, "our bacteria counts each month have averaged below 1,000 per million (plate count) and at times as low as 200."

As soon as milk is drawn from the cow in the Chesterbrook Dairies, it is chilled and kept cold until used. If the milk is to be pasteurized, it is first cooled, then heated rapidly to 142 degrees Fahrenheit, held for approximately 20 minutes at this temperature, then cooled to 42 degrees in a few seconds as it flows over the cooler into the bottling machine. Bottled milk is placed in the refrigerator immediately and held at 35 to 40 degrees prior to loading on trucks.

A Carrier cold diffuser and ammonia compressor is used in the Chesterbrook set-up with evaporating coils and a brine storage plant. The refrigerating system is the brine storage type to permit the use of a small compressor which cools a volume of brine sufficient to cool the milk through the entire range of approximately 95 degrees to 40 degrees.

S S S

G. H. Smith
Indiana

I want to take this opportunity to tell you that I believe you have the best publication on refrigeration service. Wish it were published twice a month.

The Application of Controls to Commercial Refrigeration

By A. B. NEWTON*

THE growing concern of the public for the safeguarding of its food supply, and a better understanding of the part played by refrigeration in its preservation is causing a rapid expansion of the commercial refrigeration industry. This growth is taking place in spite of the fact that the industry is not new, and is due partially to the opportunities now open to modernize existing installations and also to a better appreciation of refrigeration on the part of the general public and its merchants obtained from experience with domestic refrigerators.

Those industries which serve commercial refrigeration without actually manufacturing the operating equipment, have grown also. Refrigeration controls fall generally into this category, and it is my purpose to discuss the controls now available to the field, showing the present limitations and advantages of the more common control systems, but first let us briefly examine the refrigeration equipment which we are called upon to control.

In commercial refrigeration we usually are dealing with tailor-made installations. Walk-in boxes, and oftentimes fixtures, are made to fit the installation, and evaporator coils are chosen from standard units provided by various manufacturers. During the operating cycle of the condensing equipment frost is built up on the coils, and some provision must be made, if the job is to run continually day in and day out, to remove this frost periodically and thus maintain the capacity of the system.

Application of Refrigeration to Commercial Installations

Usually the equipment is designed to take care of the maximum load conditions and give a running time for the compressor of 14 to 16 hours per day. On practically all installations the load varies widely from day to day, and from season to season. As a result this ratio of operating to idle time must be changed if proper temperature is secured. It is not desirable to have long shut-down periods during which no cooling is provided, and therefore controls should provide frequent operating periods even during the periods of light load.

The control problems involved are, therefore, distinctly different from those met in domestic refrigerators, even though we have lately seen several attempts to apply domestic controls to commercial work. We must remember that the domestic refrigerator is sold as a package unit, with an evaporator and complete condensing unit contained therein. The evaporator must be operated at a temperature low enough to insure freezing and holding of ice cubes and desserts. This has meant frosting of the evaporator, and the defrosting cycle is usually started manually.

In commercial refrigeration we are dealing with various types of mechanical equipment applied to the fixtures. Until a few years ago bare pipe coils were common in commercial work. Very often these coils were refrigerated by ammonia, and thick accumulations of frost were allowable. With the advent of other refrigerants in commercial work, it was found that finned coils were superior to the bare pipe coils used with ammonia. The first installations of this type of coils were of the gravity circulation type, in which a large coil was placed in the fixture in such a position that the air it cooled would cause circulation, due to its increase in weight. More recently we have seen many installations in which the air is mechanically circulated over the finned coils, and here again the problem of defrosting has been serious, and new control problems have been introduced.

With the changes in the types of coil and refrigerants used in commercial work, we have also seen a change from the float type of expansion valve to the thermostatic expansion valve. The thermostatic expansion valve is particularly applicable to coils and refrigerants which require high refrigerant velocity for efficient heat transfer. In using

* Minneapolis-Honeywell Regulator Co.
Paper delivered at 4th Annual Convention R.S.E.S., Chicago.

thermostatic valves it is desirable to maintain substantially constant superheat at various suction pressures, and several valves have now been placed on the market which accomplish this result. These valves, when properly adjusted, allow maximum efficiency from the evaporator under conditions of varying load, and thus have helped the control picture to some extent.

In stores which require a number of fixtures it has become common practice to supply the refrigeration for the entire group from a single condensing unit. This practice has become more and more common, until one sometimes sees 6 to 10 fixtures operating from a single compressor. These multiple installations have introduced several serious problems, arising from the fact that the load in the various fixtures may vary independently. Thus we may have a situation where the store owner placed a large amount of produce in his walk-in box, and works out of the walk-in box while cutting up his meat, preparing it for sale. The meat is then put in counter cases, and during the rush periods he works out of the counter cases, leaving the walk-in box closed most of the time. This practice results in a heavy load on the walk-in box, while the meat is being prepared, and during this time the load on the counter cases may be very small. During the rush period the reverse situation is true —the heavy load being on the counter cases. Various methods have been advanced for securing uniform temperatures in all fixtures under these varying load conditions. Perhaps the most common system is the use of solenoid valves with individual thermostats in the fixtures. These problems are made still more difficult when some fixtures must be held at different temperatures from those required in other fixtures, and in this case two temperature valves may be employed.

In the usual commercial job the temperature of the fixtures is between 30 and 50 degrees, or so, and when the compressor is operating, the evaporator temperature is normally below the frosting temperature. It is, therefore, necessary to periodically defrost the evaporator and prevent the building up of a thick accumulation of frost on the cooling surfaces. There are several reasons because of which defrosting is necessary.

1—The building up of a layer of frost on the evaporator surfaces acts as an insulator to the flow of heat from the fixture to the coil. As the frost layer becomes thicker and thicker, lower and lower suction pressures are required from the condensing unit to do the same amount of cooling. As it increases in thickness the frost impedes the travel of air through the coil, and as the air velocity becomes lower, the rate of frosting increases. These actions result in a marked decrease in the capacity of the refrigerating system, and if allowed to continue over a long period, control of the fixture temperature may be lost.

2—The effect of frost on relative humidity in the fixture is rather marked. If defrosting is provided at frequent intervals before the layer of frost on the cooling surfaces has reached an appreciable thickness, much of the water which was accumulated on the surface will re-evaporate into the atmosphere in the fixture during the defrosting period. When this condition exists the relative humidity in the fixture can be maintained considerably higher than it can be if a large amount of frost accumulates on the fins before defrosting occurs.

3—Accumulation of frost on the evaporator surface results in operation at a lower suction pressure with a marked decrease in the economy of the refrigeration system. Therefore, the more frequent the defrosting periods, the greater the economy of the system.

The defrosting action of the system is to a large extent dependent on the type of control that is used. Therefore, I wish to discuss three of the most common control systems used at the present time, touching upon the reactions which they produce in temperature and humidity conditions, and upon the service and adjustment required by these various methods of control.

Methods of Commercial Refrigeration Control

Pressure Control. One of the most common methods of controlling commercial refrigeration installations is by the use of a suction pressure controller. This control operates to start the compressor when the suction pressure has risen to a desired value, and to stop it again when it has reduced the suction pressure to the low limit desired. The outstanding advantage of this type of control is that when properly installed, the suction pressure may be allowed to rise sufficiently during each cycle to insure de-

frosting of the coils. That is, the cut-in pressure can be so chosen that for the refrigerant involved, the coil temperature will be above 32 degrees before the control starts the compressor. Fixture temperature can be adjusted only by changing the control setting in such a manner as not to upset the defrosting action. Since pressure controls are often supplied as standard equipment on condensing units, this method of control is rather widely used.

Difficulties Experienced

In analyzing a large number of jobs with this type of control, it appears that there are several rather common difficulties experienced in its use.

1—The suction pressure control merely operates to maintain the coil temperature within definite limits with regard to the load conditions on the fixtures cooled by the compressor. As a result the fixture temperature is seriously affected by the load conditions. Many service calls on pressure control systems are a result of temperature variations caused by placing large quantities of produce in the fixtures.

2—The customer himself can not easily adjust the pressure control, since he is not acquainted with the theory of refrigeration nor construction of the control. With most of the controls now on the market, the adjustment requires a knowledge of the relationship between the cut-out and cut-in pressure. Even trained service men often have difficulty in reaching the desired adjustment.

3—There is usually a large difference between the summer and winter loads on fixtures. As a result seasonal adjustment of the cut-out pressure is usually required to secure uniform fixture temperature, and since the customer can not make this adjustment himself, a service call usually results.

4—The week end and holiday temperature secured in the fixture is likely to be too low, if the fixtures are not used during this period. No fixed adjustment of the pressure control can satisfactorily take care of this situation, and since weekly adjustment of controls is impractical, we often find difficulty from freezing of tender vegetables over the week end.

5—Since the coil frosts on each cycle, and the coil temperature reaches the same low value on each cycle, the relative humidity at light loads is often less than desired.

6—If the condensing unit is in a location where it can become colder than the fixture, the pressure in the system can not rise sufficiently to cause the compressor to start.

A fairly definite procedure can usually be followed in the installation and adjustment of a pressure control. A location for the control should be selected where it will be free from vibration, such as a wall or fixture, or even on the condensing unit itself if the unit is mounted on a firm foundation. If the pressure control contains a mercury switch, the control should be accurately leveled to secure proper operation. This leveling is usually accomplished by shifting the control in slotted mounting lugs. The low side pressure element is then connected to the suction line to the compressor at any convenient point. To insure that air is not drawn into the refrigeration system, it is a good practice to blow a small amount of refrigerant out through the tubing before the connection at the control is made tight.

On most of the pressure controls now available, two adjustments are provided—one of which affects both the cut-out and cut-in pressure, and may be called the main range adjustment, and the other which determines the difference between the cut-out and cut-in pressure, and is called the differential adjustment. The differential usually adds to the cut-out pressure to give the cut-in pressure. With controls of this type the cut-out pressure should be adjusted to secure the desired coil temperature at the point of stopping the compressor. The differential should then be adjusted great enough so that the cut-in pressure will allow the coil to rise above 32 degrees before the controls cut in.

Whenever the cut-out pressure is adjusted on an existing job, using this control, it is necessary to change the differential of the control an amount equal to the change which is made in the cut-out pressure. Thus if it is necessary to lower the cut-out pressure 4 pounds, the differential should also be increased 4 pounds at the same time, so that the cut-in pressure will still be about 32 degrees, assuming the previous adjustment was correct.

The pressure drop between the evaporator and the pressure tap where the control is

connected to the suction line must also be considered in setting the cut-out point. The pressure drop will occur only during the operating cycle of the compressor and, therefore, the cut-out pressure should be lowered an amount equal to the pressure drop below the desired pressure in the coil at cut-out. The differential must also be increased a like amount in order to have the coil temperature rise above freezing when no pressure drop exists.

A common method of controlling multiple systems is to operate the condensing unit by means of a pressure controller, using thermostats in the important fixtures to operate liquid line valves. If all fixtures have thermostats, they may also be connected in such a manner that the compressor does not operate until one or more fixtures require the cooling. Care must be taken that the cut-out pressure is high enough to prevent the fixtures alternately calling for cooling with resulting long operating periods and heavy frost accumulations.

Temperature Control. On some of the smaller commercial refrigeration jobs, we find a temperature controller used to start and stop the compressor—no pressure control being used. This control system has been used to some extent even on larger installations.

The temperature control normally has the advantage that it gives a uniform fixture temperature under normal load conditions. However, as load conditions vary we often find serious trouble caused by frosting of the evaporator.

Whether or not the evaporator defrosts on the "off" cycle is determined by the relative length of the "on" and "off" cycles of the compressor. In turn, the relative length of these cycles is determined to a large extent by the differential of the thermostat. Thus we generally find it necessary to adjust the differential of a temperature controller so that it will be high enough to secure defrosting during the "off" period of the equipment. The differential required under the heavy load condition is usually different from that required under the light load condition and, therefore, we are often called upon to seasonally adjust the differential of the thermostat on temperature controlled jobs. This, of course, means extra service calls, since the customer does not understand the differential adjustment of the thermostat.

Once frosting starts to occur the rate of frosting increases rapidly. Thus, if during an initial operating period a light coating of frost is obtained on the evaporator, and this coating remains during the "off" cycle, another coat of frost will be added during the next operating cycle. After several periods of operation the coating of frost becomes thick enough so that the suction pressure is materially reduced, and the resulting colder coil causes an increase in the rate of frost formation. It is possible to obtain almost solid icing of a finned evaporator, under these conditions, and serious service calls may result from this action.

In the installation of temperature controls it is necessary to select a location where the control will respond to the air temperature in the fixtures. On gravity jobs it is common practice to locate the temperature control in the cold air duct of the fixture. The exact location will depend on the characteristics of the particular fixture in which the control is placed. Where one is not familiar with the fixture, a remote bulb control is particularly applicable, since the bulb may be moved about until the proper location is found without changing the wiring.

Application to Blower Units

Blower type units offer a special problem as far as the location of the temperature controller is concerned. The controller should not be located directly in the air stream from the blower, and yet must be so located that it will respond rapidly to changes in the fixture temperature. Usually the best location appears to be on the side of the box adjacent to the blower, so that the air stirred up by operation of the blower passes over the thermostat after it has come in contact with the opposite wall of the fixture.

Pressure and Temperature Control. A third system of control which is common at the present time is the use of a low pressure control and a temperature control connected in series. With this arrangement the contacts in both the temperature control and the pressure control must be closed before the compressor can operate.

This system provides a measure of the fixture temperature and secures uniform temperature under normal load conditions. Since frosting of the coil is sensed by the pressure element, serious frosting on jobs of this type is largely overcome. Such problems as seasonal adjustment and cold temperature on the week end are largely

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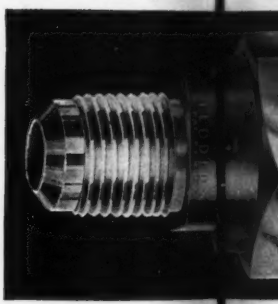
AUTOMATIC PANSIO

The Fedders Mod Automat Valve offers the eration ind sults of yea s of ring and rience.



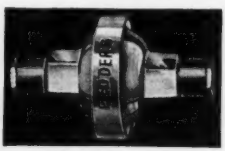
CHE VALVE

For multiple installations keep the the warmer evaporator backin evaporator.

THERMOSTATIC EXPANSION VALVE

Gives easy, sensitive adjustment, accurate refrigerant control and dependable performance in the field.

CARTRIDGE-TYPE NEEDLE-SEAT ASSEMBLY



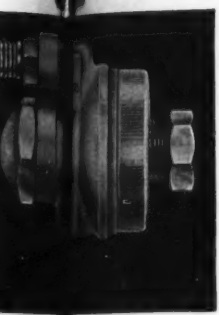
In spite of the extreme care which is used at the factory to assure a clean system, there are so many factors beyond human control that it is low cost insurance to always install a Fedders Filter on the Liquid Line of every job, both domestic and commercial.

Model 6586 above
Model 7150 below

Fedders Dehydrators consist of a brass cylinder equipped with Fedders filter cells at each end and space between for a liberal charge of standard drying agent.

Engineered to Give Service

DES Gives You Right Valve for RY EED . . .



OMATIC PANSION VALVE

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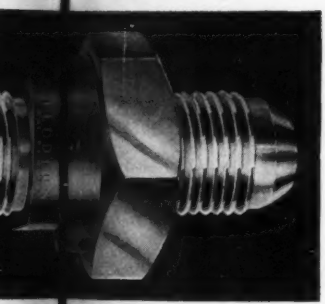
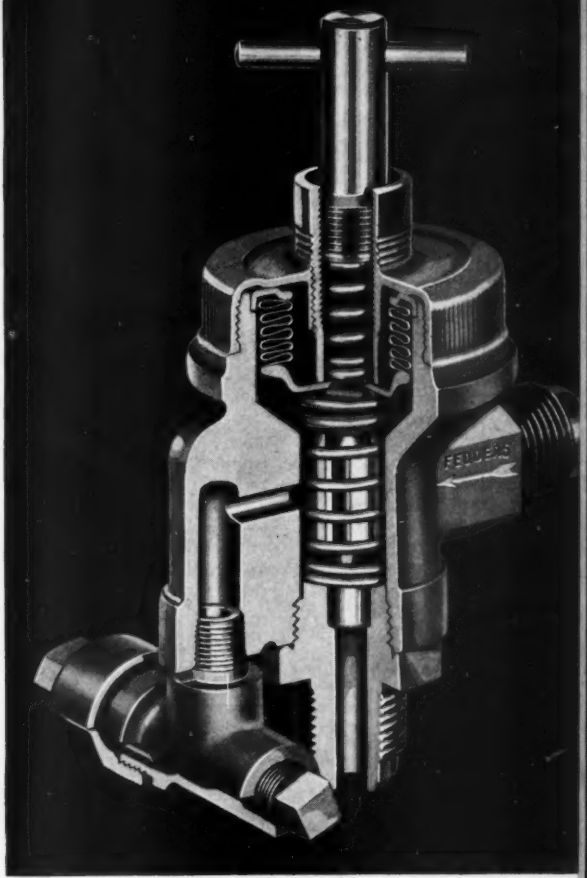


CHE VALVE

tallations keep the high pressure gas in porator from backing up into the colder



CONSTANT PRESSURE VALVE

Refrigeration men are welcoming the Fedders Model CP-35 Constant Pressure Valve as a simple, easily installed, economical and extremely accurate means of controlling each unit in a multiple system with cooling units necessarily operating at various loads and temperatures.

Heat Transfer Specialists Since 1896

FEDDERS MANUFACTURING CO.

57 Tonawanda St. - - Buffalo, N. Y.

SUPPLIERS EVERYWHERE

eliminated if the initial adjustments are sufficiently accurate. Under normal load conditions the control of the compressor is obtained from the thermostat. Whenever conditions exist that cause the accumulation of frost on the evaporator, the suction pressure is lowered until the cut-out of the compressor is finally obtained from the pressure controls. The frost accumulation may go on for a large number of cycles with cut-out and cut-in of the compressor obtained from the thermostat before the suction pressure becomes low enough to cause the compressor to cut-out. Defrosting is not secured until the compressor is cut-out by the pressure control, and thus considerable frost accumulation may be obtained before a defrosting cycle. As a result the temperature rise during the defrosting cycle may be undesirably large, and there is also an adverse effect on the economy of the system and on the relative humidity secured in the fixtures.

In an effort to secure frequent defrosting cycles, the cut-out pressure of the low pressure controller is often adjusted with 1 pound or 2 pounds of the normal pressure obtained when the thermostat stops the compressor. This is a rather critical adjustment and, therefore, if an attempt is made to adjust the pressure control as closely as this to the normal cut-out pressure, seasonal adjustment of the cut-out pressure will also be required. Thus even with the combination of pressure and temperature control, using conventional instruments, seasonal adjustment is some times necessary and, therefore, servicing is required on installations of this type.

The foregoing discussion is presented as a brief picture of the status of commercial refrigeration control as it is today. Admittedly, it is not as bright a picture as might be desired, and probably this comes from the fact that today's commercial controls are oftentimes merely adaptations of devices designed for other purposes, or outgrowths of such devices. The commercial refrigeration industry is now large enough to stand on its own right, and I would recommend to all concerned a more detailed study of its own specialized needs, and the designs and development of equipment expressly to meet these needs.

? ? ?

"D" or "SD" 1934—Enclosed unit, stamped on the suction port with the following: "SD-50" or "SD-60"—the 50 and 60 indicating 50 or 60 cycle. Another method of identifying the cycle of the compressor is the spaghetti in the electrical unit—if this is red it is a 50 cycle, if black a 60 cycle. This also applies to the front lip of the electrical unit, which is painted red on the 50 cycle, black on the 60.

"J" & "K" 1935—Using a ½" suction line. These pumps are interchangeable.

"H" 1935—Using a ⅝" suction line.

"M" 1936—Using a ½" suction line.

"R" 1936—Using a ⅝" suction line.

"W"—All 1937.

If there is any other information I can give you with reference to Grunow units, I will be glad to help. — *H. D. Hill, service manager for The M and M Co., Cleveland, Ohio.*

HOW DOES HUMIDITY AFFECT LIGHT RAYS

Question 260. How does relative humidity affect the transmission of light rays?

What is the simplest way to measure the amount of dust in the air of a room or auditorium?

Answer: With respect to how the relative humidity may affect the transmission of light rays, I am in no position to make any definite statement. Hower, it is my belief that the relative humidity will have practically no effect on the transmission of light due to air of high humidity being slightly lighter than air of low humidity. It is possible that the light rays might be speeded up due to the lighter medium somewhat, and that if air of high humidity and air of low humidity were in various layers, there might be some tendency to refraction. I believe that any such effect would be so slight, however, as to be immeasurable.

As the relative humidity approaches 100 percent we quite often have a foggy condition, or in other words, water vapor or mist in the air which will affect the transmission of light.

With respect to the simplest methods of measuring the amount of dust in the air, I suggest you refer to the section of the Air Conditioning Engineers Handbook, which deals with sampling and measuring dust quantities in the air.

MORTUARY REFRIGERATORS

Question 261. What would be the best temperature and humidity at which to keep a mortuary refrigerator for a medical school, where the bodies will be held for a considerable period, and be in and out of the refrigerator frequently?

Is the sudden change from refrigerator to room temperature a big factor in the length of time a body may keep?

Should the bodies be brought gradually up to room temperature?

Would the expense of cooling the dissecting room be justified, and at what temperature should it be kept?

Is humidity a factor? There are many very humid days in this section throughout the summer.

Would blower coils in a mortuary refrigerator be satisfactory?

Answer: Apparently there is very little information available on the application of refrigeration to mortuary refrigerators, or to medical school refrigerators, which so far as I can learn, are two entirely different applications.

The difference is created due to the fact that in mortuary refrigerators, the body, in all probability, is not embalmed before being placed in the refrigerator, and is, therefore, subject to rapid deterioration, while in the medical school refrigerators, where the body is used for dissecting purposes, it is almost always embalmed, in which case humidity is the primary reason for keeping it in the refrigerator at all. After the body is embalmed, temperatures of a moderate degree will not affect the body in any way, with the exception that the fatty tissues at high temperatures have an inclination to liquify, and create disagreeable odors. Thus, it is only necessary to reduce the temperature to approximately 50 degrees.

So far as I can gather, the temperatures maintained in mortuary refrigerators are as near 32 degrees as possible, without permitting freezing, and the humidity should be from 70-75 percent. Blower coils in either application would not be satisfactory, due to the drying effect produced by them. The humidity in both cases should be kept as high as possible, since there is always a great tendency toward too much drying.

The above are views that I have been able to gather, together with my own, in a general way. The following are the comments made by a doctor on each of your questions, and I will give them to you just as they were given to me:

(1) Temperature should not be too cold because the student's hands get stiff and unable to work; also, the body

cannot be worked on if it is too stiff. Probably around 50 degrees F.

(2) Sudden change would not affect dissecting in any way.

(3) No. They will be brought up gradually enough by just exposing to warmer air.

(4) If the room was cooled, it would be too cold for students, as they usually have four-hour classes.

(5) Can't be too humid, as bodies dry out too rapidly, anyway. Usually use water-soaked rags to dampen bodies.

I am sorry that we are not able to give you definite information on this matter, and I would suggest further that you submit your questions to The Journal of the American Medical Association, 535 N. Dearborn St., Chicago, Ill. I believe they would possibly be able to answer your questions to a better degree than we can.

SODA FOUNTAIN TROUBLE

QUESTION 262. **(1) I have for service a Liquid Carbonic soda fountain that has me puzzled. It has two lowside floats connected to one suction line. One float, or rather flooded evaporator, is used to refrigerate a water bath through which passes the drinking water and carbonated water. The suction line from this boiler passes through a Frigidaire two-temperature valve that closes at four lbs. On the front of this boiler (header) there is a special fitting which permits liquid SO_2 to draw from the inside at low pressure (four lbs.). From this fitting, a ¼-inch tube passes through the syrup rail, and into the ice cream evaporator. Due to the temperature of refrigerant, this line frosts and refrigerates the rail. Recently I was called on this job and found a frost-back at start of each cycle, which would continue for 30 minutes, or so, then defrost toward the end of the running cycle. The cut-out was 17 inches; cut-in 0 lbs. gauge. Checking for gas, I found it okay, condensing unit okay, head valves holding, floats closing the needles tightly, and screens clean. I decided to place a check valve between the ice cream coil and the two-temperature valve. I reasoned that the gas, or some part of it, was condensing back into the ice cream boiler. This stopped the frost-back and machine worked swell for about two weeks. Then, gradually the temperature started to rise in the ice cream compartment. Water was okay, but machine now short-cycles; runs one minute, off three. Very little load on water bath. My present conclusion is that oil has blanketed the one boiler to the extent that I'm getting very little refrigeration. Do you think reeds in the tubing of the coil would help here? What is the recognized way to return oil from boilers of this type? What are your suggestions as to my trouble? Also, recommend switch setting.**

(2) Is there any danger of a mixture of sulphur dioxide and methyl chloride exploding? I was told that a certain mixture of these two refrigerants was a very deadly explosive.

(3) Where can I obtain general information on silver soldering, cleaning agents to use, temperatures, fluxes, etc.?

ANSWER: (1) I do not believe that a check valve will work satisfactorily in the location you have placed it in this type of system. Your trouble, I believe, was due ordinarily to a sticking float needle in the ice cream coil, which would cause a rather erratic action, and is still probably causing some of your trouble.

Your reasoning that the gas is condensing back in the line, I don't believe is correct, because any condensing of gas would be done in the boiler itself, or in the coldest location of the system. The system now is operating on the pressure from the sweet water coil, and not giving the ice cream coil a chance at all. This is due to the fact that as the sweet water coil warms up, the pressure from that operates the motor switch, causing the machine to start, whereas, if the check valve was not in that location, the pressure from the sweet water coil as it built up would condense in the ice cream coil until the pressures in both were equalized. Then, the machine would start up pumping from both coils at the same time, and operating over a longer period than at present. It is quite possible that you have oil in the ice cream coils due to this situation. In order to get the system back in normal operation again, it may be necessary to remove this oil in addition to cleaning the needle, and seeing that it operates freely. I am informed by Frigidaire that they no longer use this type of hookup, and that in existing installations, they are installing an expansion valve on the syrup rail with a TR valve in the suction line, and running a new liquid line to the ice cream coil.

The pressure settings you have stated, I believe, are okay with this application. Reeds installed in the tubing of coils of this nature are seldom of much value. They are usually only used on very long coils, where

the length of tubing in each coil is excessive.

(2) I have never heard of any case where sulphur dioxide and methyl chloride mixtures were explosive. We have had many installations where sulphur dioxide has been used as a chaser in methyl chloride systems, and I don't believe there is any danger of explosion in such cases, providing nothing else enters into the mixture.

(3) There is a new solder that has been placed on the market by Imperial Brass Mfg. Co., an announcement of which was made in the November issue of THE REFRIGERATION SERVICE ENGINEER, on page 71, and which I believe will answer your purpose better than silver solder. Further information on it can be obtained from Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.

* * *

J. L. Hall
New Hampshire

As a subscriber to THE REFRIGERATION SERVICE ENGINEER, I take great pleasure in reading your magazine.

Robert C. Boehm
Wisconsin

Enclosed is post office money order for $2.00 for REFRIGERATION SERVICE ENGINEER, beginning with the April issue.

It sure is a good magazine—worth its weight in gold any time.

NEW MECHANICAL DEVICES
Service Tools and Special Equipment

Under this heading there will be published illustrated descriptions of new or improved service tools and equipment for the Service Engineer. Information contained in this department is furnished by the manufacturer of the article described and is not to be construed as the opinion of the Editor.

MINNEAPOLIS-HONEYWELL INTRODUCES THE POLARTRON SYSTEM

THE Polartron System, called the most outstanding advance in recent history of commercial refrigeration control, has been announced by its manufacturers, the Minneapolis-Honeywell Regulator Company.

"It provides an entirely new conception of above-freezing commercial refrigeration," L. B. Miller, manager of the Refrigeration Division, said in making the announcement, "because it approaches the problem from a different angle. It is not merely a pressure or temperature switch, nor a combination of the two, conventionally applied.

"Instead, the Polartron System consists of a new primary controller and a thermostat. The controller senses conditions within the refrigeration system. The thermostat accurately follows each change within the fixture. Their respective functions are interlocked within the controller to produce new standards of refrigeration results.

"In the field, commercial refrigeration control has always been a difficult problem. It must serve a wide variety of installations. It must closely follow the load changes within the fixture. Service in and out of the box and changes in the amount of contents affect the internal load. These conditions vary most over week-ends.

"It must sense the constantly fluctuating surrounding temperatures, the most serious of which are the seasonal weather changes. It must maintain proper temperature and relative humidity within the fixture.

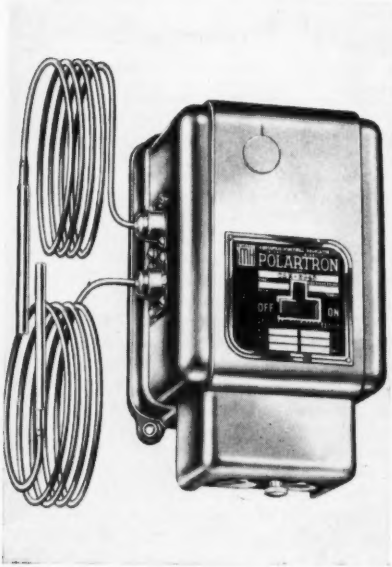
"Chief among commercial refrigeration ills has been the collection of frost on the coils. The occurrence of frost tremendously handicaps the system, coil effectiveness is reduced, and the compressor works more in an attempt to maintain the desired conditions. The collection of frost means that some moisture is being removed from the products. This not only injures the products, but the reduction in product weight is an actual loss in dollars and cents when the products are resold.

"The extreme flexibility of the Polartron System accentuates the limited scope of conventional controls. Its performance is really so revolutionary that it out-modes and outdates all other commercial refrigeration control.

The Polartron System not only produces new standards of refrigeration control, but by the fundamentals of its operation, it compensates for deficiencies in the refrigeration system itself. Results obtained from extensive field tests are far beyond our expecta-

tions. In some instances it has revived jobs so sick that they seemed beyond hope of recovery. Within capacity limits of the refrigeration equipment the Polartron System will provide precise control and frost-free refrigeration.

"Besides this, for the first time, the user will have fool-proof cooling control. With finger-tip adjustment the control can be set for any above-freezing temperature, and sensitive and accurate regulation can be obtained without upsetting the system balance in any manner. Although it brings a new conception to commercial refrigeration control, there is really nothing new in the principle behind the Polartron System. Minneapolis-Honeywell engineers merely applied famous Series 10 Circuit to refrigeration. This is the circuit which provides the accurate and sensitive control of automatic



THE NEW M-H CONTROL

heating systems. Its safety features are in a large measure responsible for making M-H Controls standard equipment on 80% of the oil burners in service today.

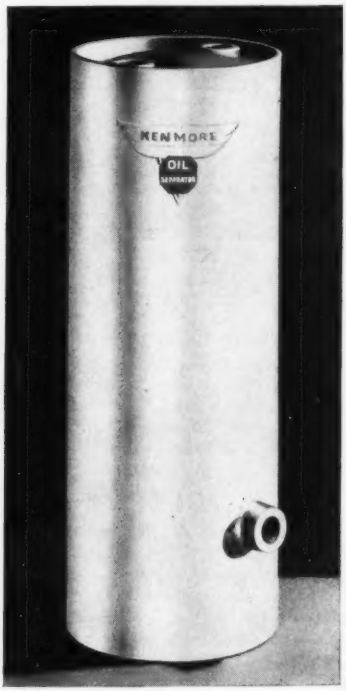
"The Polartron System will do for the refrigeration industry just what the Series 10 Circuit has done in the heating field. Your customers . . . grocers, butchers, florists, restaurant men, and others are waiting for the Polartron System. . . . It will not only modernize existing refrigeration systems, but is equally effective for new installations. "Polartron" is a year-around business builder for dealers, salesmen and independent service engineers. The Polartron System is truly the answer to all above-freezing refrigeration control problems."

S S S

KENMORE OIL SEPARATORS

TWO lines of Oil Separators and combination High Side Floats and Receiver Assemblies are announced by the Kenmore Machine Products, Inc., Buffalo, N. Y.

"Kenmore Oil Separators utilize thermal and mechanical principles to prevent con-



KENMORE OIL SEPARATOR

densation of the refrigerant in the oil," stated G. W. Smith, vice president, in commenting on the design which has been developed during long experience in refrigeration engineering as well as manufacturing parts for leading manufacturers.

Their action in preventing condensation of refrigerant in the oil safeguards the com-

pressor and at the same time improves the efficiency of the entire system.

Large, buoyant float and elimination of friction drag assure positive action of the needle valve. Leak-proof cylinder and headers are copper-hydrogen welded and fused. There are no gaskets and bolts.

Kenmore Oil Separators are built for use with commercial refrigeration units from ¼ to ¾-hp. The High Side Float and Receiver Assemblies are built in 6 and 10½ inch sizes.

Both products can be used with all standard refrigerants except ammonia.

Description and specifications are given in Bulletin 385.

S S S

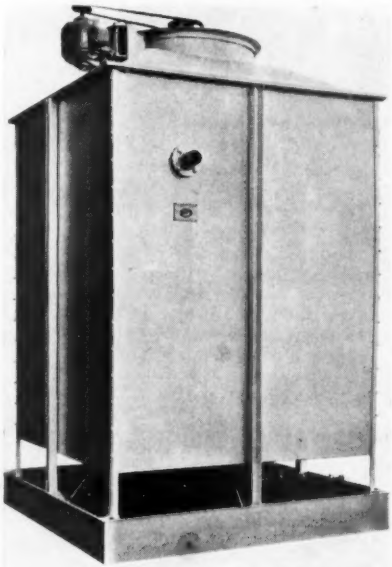
NEW SMALL INDUCED DRAFT COOLING TOWERS

THE Marley Company, 3001 Fairfax Road, Kansas City, Kansas, announces the addition to its broad line of water cooling equipment a complete series of small steel-cased induced draft cooling towers. These include horizontal wood filled types for use indoors and vertical types for outdoor service, either wood or spray filled. All models, indoor and outdoor, are entirely self-contained, with no protrusions or obstructions to present a cleaning problem.

These new towers are designed to bring to the small capacity field a maximum of cooling efficiency plus important economies in operation and maintenance. They incorporate all the time-proved advantages of design and performance which feature the larger Marley mechanical draft units now extensively used in every kind of industrial and air conditioning service. Patented Marley non-clog spray nozzles of bronze and galvanized steel pipe headers and nozzle arms are utilized in all of them.

The indoor towers are horizontal in construction and in air movement. Four standard sizes range from 2½ feet x 7½ feet x 3 feet 2½ inches to 2½ feet x 8½ feet x 6 feet 8½ inches. Casings and basins are 16 gauge copper bearing steel, shop painted two coats. They are equipped with Marley fans with guard grills which may be removed when a discharge duct is used. Zigzag drift eliminators of heart redwood and cast-iron spacers are built as one unit, easily lifted out for access to tower interior. Removable redwood decks and spacers constitute the filler through which the water filters down after down-spray injection at the top. These towers are shipped fully assembled, with simple instructions, ready for operation.

The vertical outdoor towers are available in either wood-fill or spray-fill types, each in twelve standard sizes from 2½ feet x 2½ feet x 9 feet 1 inch to 10 feet x 10 feet x 14 feet 3 inches. They are equipped with multiple-effect drift eliminators of heart redwood with cast-iron spacers and Marley fans having "V" belt drives from motors mounted on the tower "roofs." In the wood-fill type water is up-sprayed at the top and decking is of heart redwood. Two levels of downspray nozzles are provided in the spray-fill types. Both types are shipped knocked down in shop fabricated, easily handled units, which need only to be bolted together for immediate operation.



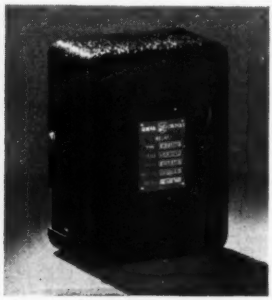
SMALL INDUCED DRAFT COOLING TOWER

The wide versatility of this new line is held to be one of its greatest assets since one of the twenty-eight models supplies the proper answer to practically every small water cooling problem. The Marley Company expects these small series towers to have a broad appeal in the ice-making and air conditioning fields for cooling condenser and compressor circulating water. They are also well adapted to jacket water cooling for small diesel engines, air compressors and similar equipment.

A NEW RELAY BY GENERAL CONTROLS

A NEW relay capable of handling single phase motor loads up to 1-hp. or heating loads up to 1.5 k.w. is announced by the General Controls Co.

The "General RS 100" is specifically designed to meet the needs of the automatic



A NEW RELAY

heat, refrigeration, and air conditioning industries, according to the manufacturer.

An exclusive feature of the RS 100 is an extra terminal for supplying power to wall clocks, indicating lamps, or small sensitive relays, eliminating the necessity for a separate low voltage source.

A bulletin on this new relay may be had by writing the General Controls Co., 450 East Ohio St., Chicago, Ill.

S S S

A NEW FLARE NUT WRENCH

THE Snap-on Tools Corp., Kenosha, Wis., announce the addition to their line of tools of a Flare Nut Wrench.

These new Flare Nut Wrenches are designed to work in the closest of places, being made with a wide-sided, thin-walled split boxocket head.

This type of head gives a grip on four sides of the nut and for practically the full

FLARE NUT WRENCH

length of the nut, thus eliminating danger of slipping and preventing damage to soft brass flare nuts, the split boxocket enabling the wrench to be used over tubing and pipe in very close places.

This new wrench is made in a particularly large range of sizes, running from 3/8-inch up to 1 5/8-inch, and including the popular sizes encountered in refrigeration work—3/4-inch, 7/8-inch, 1-inch and 1 1/8-inch.

S S S

A NEW TYPE WHEEL PULLER

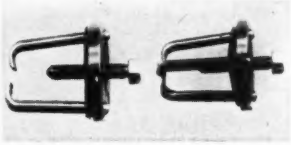
A UNIQUE flywheel and gear puller that has long been needed in the refrigeration service field is now being offered by the Flushing Refrigeration Company, 133-22 41st Avenue, Flushing, N. Y.

It was invented and designed by Ernest E. Condon, who is well known for the CY purging and charging valve kit he gave the industry a few years back.

What makes this puller so unique is that the pulling arms can be set at any angle within a radius of 180 degrees, thus really making it a Universal puller unexcelled for all purposes.

This wheel puller will take care of practically every job the serviceman or shop will come in contact with for repairs, where a wheel or gear puller must be used.

Another unique feature of this puller is that only one has to be used on all jobs,



NEW WHEEL PULLER

whether spoke wheels, pulleys or gears. It can be used as a three arm puller or two arm puller whichever the job calls for.

This puller will pull solid wheels and gears up to eight inches outside diameter, and will fit in close spaces down to one-quarter of an inch between compressor body and hub of flywheel. It can be changed from a three to two arm puller almost instantly, there being no bolts or nuts to remove to make the required position change in pulling arms.

Compact and light in weight, weighing only two and one-quarter lbs. when disassembled it requires a space of only one and one-half inches by four inches.

Highest grade steel is used throughout the construction of this puller. Arms are heat treated by a special process to withstand the severe abuse this tool is subjected to at all times when being used.

Offered in one model priced at $6.75 f.o.b. Flushing, N. Y.

On to Buffalo

Niagara Frontier Chapter Lays Plans for Big Fifth Annual R. S. E. S. Convention

BUFFALO—November 2, 3 and 4—will be the scene of the big Fifth Annual Refrigeration Service Engineers' Society Convention—the refrigeration service and installation engineer's own educational convention and manufacturers' exhibit.

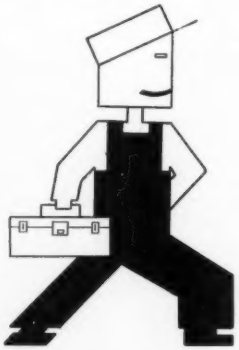
The Statler Hotel's 17th Floor Exhibition Hall will be the location of the activity where the manufacturers' exposition and the meetings of the Society will be held.

Buffalo extends its hospitality to all service engineers to attend this important meeting. Buffalo holds many attractions for the visitor. It is one of the foremost points of interest for millions of visitors each year because of its close proximity to our friendly neighbor to the north—the great Dominion of Canada—and, of course, for one of the scenic wonders of the nation—Niagara Falls. The awe-inspiring grandeur of the Falls is a sight worth seeing.

Buffalo is centrally located to the greatest population area of America, being but an overnight's train ride for seventy million people.

Now Is the Time to Make Your Plans for Buffalo in November

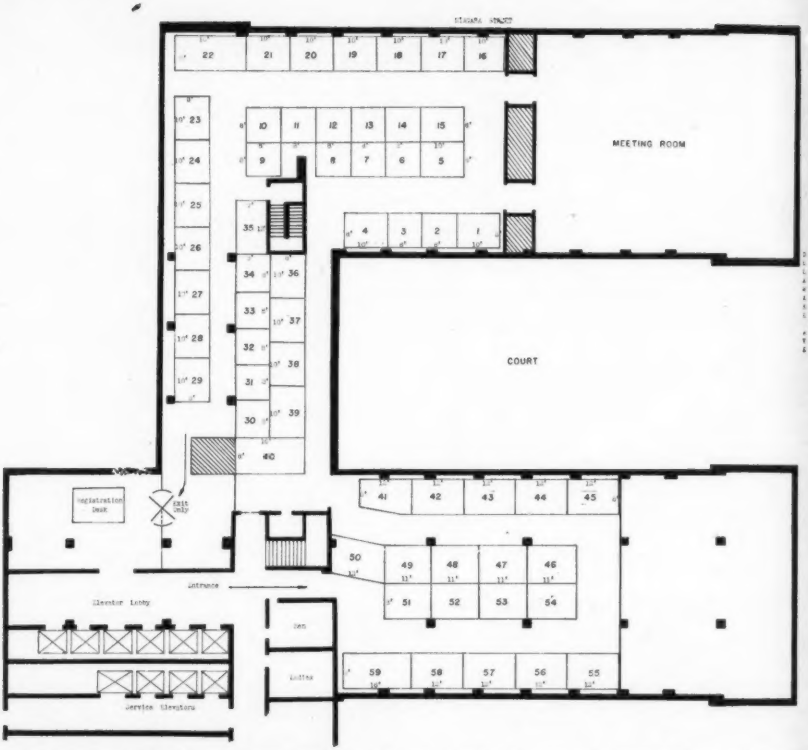
Come and participate in this educational convention. Combine a most enjoyable visit to the Queen City of the Lakes, and profit by the educational manufacturers' exposition, as well as learning from headline speakers of the industry, who will pass on their experiences to you.



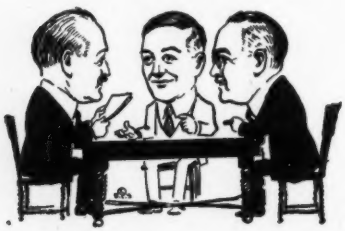
I'll be seeing you in Buffalo

Remember, the R.S.E.S. Convention is the refrigeration service and installation engineer's own convention. The entire program is designed to bring you valuable information, specifically designed for use in your everyday work. You meet co-workers from every section of the country, providing an opportunity to discuss mutual problems; how they have successfully met the same conditions which may be confronting you. The R.S.E.S. Convention will return you to

A glimpse through the trees along the rushing Niagara



Space Diagram of the Manufacturers Exposition showing location of convention meeting room adjacent to exhibit hall. Meetings and Exhibit will be held on the 17th Floor, Statler Hotel



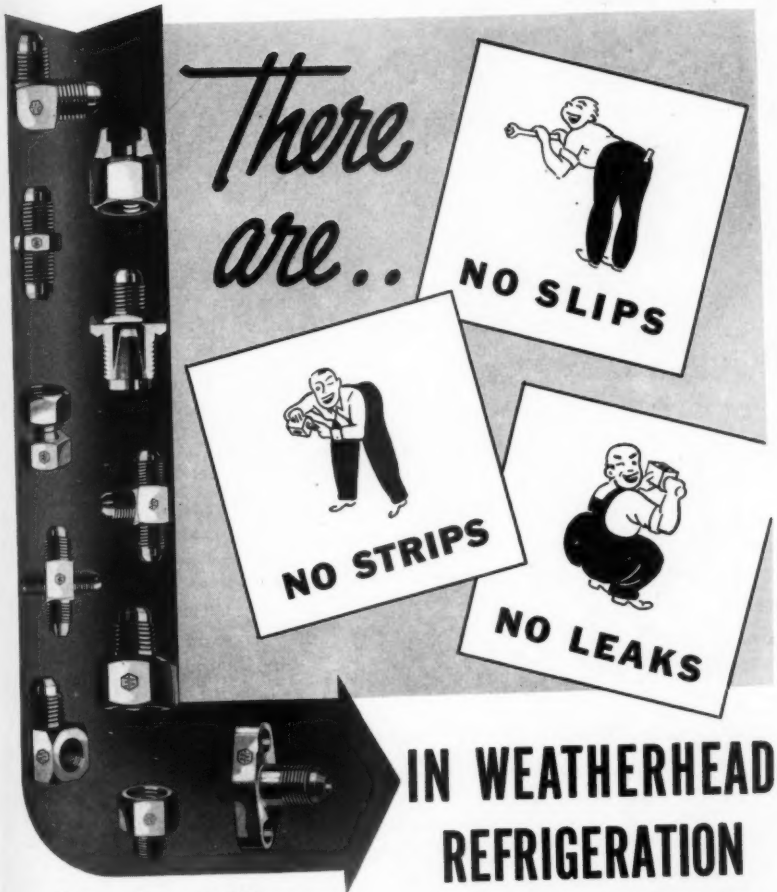
The educational committee is hard at work now preparing a program of the country's best authorities who will speak on problems and subjects of vital interest to you

your work enthused and "pepped-up" to do a better and more profitable job. It's a tonic you will thoroughly enjoy, especially after a busy and active servicing season. Your trip to Buffalo will be an investment that will return a profit the year around.

Manufacturers' Exposition

Manufacturers, who are vitally interested in you, display their products for your leisurely inspection, with experienced factory engineers to explain construction, operation and results. Here, under one roof, you have the opportunity to thoroughly inspect and learn the latest current developments in all types of refrigeration equipment, accessories, supplies and service—all designed to help you.

Truly, the trade exposition of the refrigeration service and installation profession is an important part of the educational program of the Society's annual convention. After your busy and interesting day, you can enjoy full relaxation through the entertainment features planned for yourself and family. Everything is planned to make your trip to the Buffalo convention a memorable one. Again, we say, make your plans now to be in Buffalo, November 2, 3 and 4.



IN WEATHERHEAD
REFRIGERATION
VALVES AND FITTINGS

*Leading Jobbers
Everywhere Stock Them

WEATHERHEAD

CLEVELAND, OHIO

Another View of the American Falls

By all means, remember the ladies are an important part of every R.S.E.S. Convention. They will enjoy the convention program as well as yourself.

We'll be seeing you in Buffalo, November 2, 3 and 4!

New Chapters Formed

DURING the last three months five new chapters of the Refrigeration Service Engineers Society have been formed in various parts of the country. A report of each follows:

MOUNT ROYAL CHAPTER

ON February 28th a total of 75 men attended a meeting for the purpose of considering organizing a chapter of the R.S.E.S. in Montreal, Quebec. Mr. G. A. Burns, National 2nd Vice-President, conducted the meeting, explaining the purposes and objects of the Society. Since a majority expressed a desire to form a chapter, plans were immediately started and 62 signatures were secured for the petition for charter for the new chapter, to be known as the Mount Royal Chapter.

An election of temporary officers resulted in the following: J. A. Tremblay, *president;* J. M. Turner, *treasurer;* J. A. St-Laurent, *secretary;* Frank Amey, *sergeant-at-arms.*

Subsequent meetings to date have been held at regular intervals.

Know your stuff!

Recorders of all types

PRESSURES and temperatures are basic factors on every refrigeration or air conditioning job and when it comes to measuring them it pays to "know your stuff."

Equip yourself with Marsh pressure and temperature testing equipment and be sure that Marsh gauges are also specified for all your installations. There are many reasons why servicemen choose Marsh gauges and thermometers, but the feature that has received the heartiest endorsement is the Marsh "Recalibrator." When a Marsh gauge or thermometer is knocked out of adjustment, a simple screw driver adjustment not only sets it correctly at zero, but actually re-calibrates it throughout its entire range.

Write for the complete catalog of Marsh instruments for refrigeration and air conditioning.

Dial Thermometers

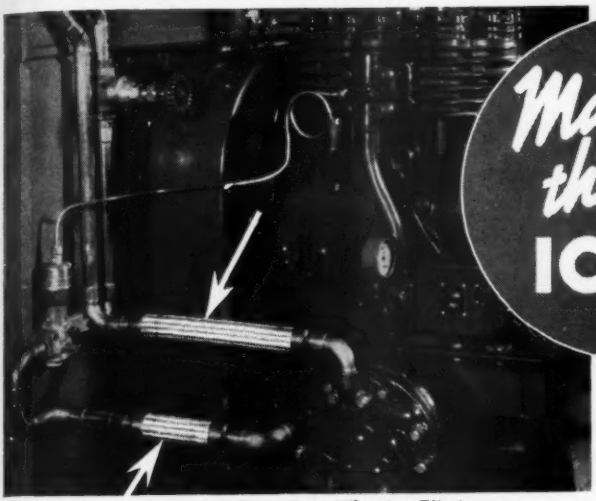
Gauges for all pressure medium

JAS. P. MARSH CORPORATION
2059 Southport Ave., Chicago, Ill.

Accurate Mercury Switches

MARSH Refrigeration Instruments

AMERICAN VIBRATION ELIMINATORS



Make the job 100%

Typical installation of American Vibration Eliminators

Stocked by leading supply dealers everywhere, they are quickly available in standard lengths and sizes up to 3"

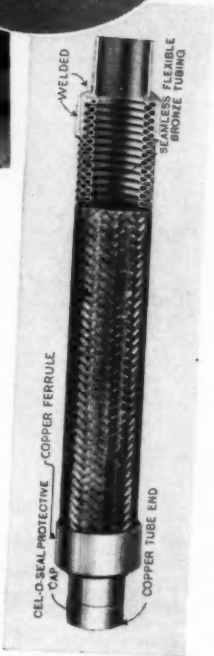
HERE is the finishing touch for your refrigeration and air-conditioning installations. American Vibration Eliminators are made of American Seamless Flexible Bronze Tubing with standard wrought copper fittings welded to each end. The welding is done at a temperature above 1,500°F. There is no possibility of weakness developing under the heat you use in soldering.

These better eliminators are leakproof, and are easily soldered as a unit into the regular copper refrigerant line. Their use kills forever the possibility of vibration cracking the refrigerant tubing, and prevents any transmission of noise.

Manufacturers of air conditioning equipment are enthusiastically recommending these eliminators. Contractors tell us they like their ease of installation. American Vibration Eliminators are thoroughly cleaned, dried out and sealed with air-tight, moisture-proof caps.

Write for Bulletin VE-2 describing these quality eliminators. Inquiries regarding unusual applications will receive careful attention.

38311



This type and design of flexible vibration eliminator was first made and marketed by us.

THE AMERICAN BRASS COMPANY

American Metal Hose Branch

General Offices: WATERBURY, CONNECTICUT

BOSTON CHAPTER

ON March 9th, a group of twenty men gathered for the purpose of forming what is to be known as the Boston Chapter of the R.S.E.S. Mr. J. B. Coffey of the Kenmore Engineering Co., Inc., who was responsible for the organizing of this meeting, explained its purposes and led the discussion.

Since the majority of those present were in favor of forming a chapter, applications were taken and the petition for charter was signed.

Mr. Arthur Burke was elected temporary secretary, and further plans were postponed until a future meeting.

MOHAWK VALLEY CHAPTER

DURING the month of March a group of refrigeration men of Utica, N. Y., joined in a meeting for the purpose of organizing a chapter of the R.S.E.S. which it was decided upon later would be known as the Mohawk Valley Chapter.

In arranging for this meeting, Mr. C. M. Doyle invited Mr. H. A. Persett, president of Central New York Chapter of Syracuse, and Mr. E. A. Davenport of Syracuse to attend to act as speakers at this organization meeting.

It was the consensus of opinion of the group present that a chapter should be formed and plans were immediately started. Mr. C. M. Doyle was elected temporary secretary to carry on the business of the chapter in its formative period.

At a later meeting thirteen members signed the petition for charter, which was immediately forwarded to the National office.

Between twenty and thirty more men have expressed their intention of joining immediately the chapter is under way.

SAN DIEGO CHAPTER

ON April 20 a group of fifty men met in San Diego, Calif., to consider the forming of a local chapter, with Mr. R. L. Darby, National sergeant-at-arms, presiding. After a thorough explanation of the purposes of this organization nineteen applications were received and a petition for charter was signed, the new organization to be known as San Diego Chapter.

At a later meeting which was held before the petition was closed, additional men signed, bringing the total up to twenty-five paid-up members.

FILTER OUT FUTURE TROUBLE with the NEW

KEROTEST

Type 901 LIQUID FILTER!

ESPECIALLY designed for ice cream cabinet service, the Kerotest Type 901 Liquid Filter is a boon to trouble-free refrigeration operation, combining the double filtering action of an asbestos sack and a fine 100 mesh bronze screen. The liquid refrigerant first passes through the asbestos sack and then the screen, effecting a very efficient filtering service.

Moreover, the *removable* End Flange makes it possible to easily clean the Strainer Assembly in a minimum of time and trouble. A large wrench square on each end and extra long pipe and flare connections complete the design of a thoroughly serviceable Filter. Made in a large variety of pipe and flare sizes. Ask your local Kerotest Jobber, listed at the right, about it.

KEROTEST

REGISTERED U.S. PAT. OFF.

KEROTEST MANUFACTURING CO.

PITTSBURGH, PA.

FOR QUICK SERVICE

KEROTEST

REGISTERED U. S. PAT. OFF.

REFRIGERATION PRODUCTS

Phone your nearest distributor

JOBBERS WITH LOCAL STOCKS

Albany, N. Y. ..... Hoy & Co.
Allentown, Pa. ..General Refrigeration Supply Co.
Atlanta, Ga. ..J. M. Tull Metal & Supply Co., Inc.
Atlanta, Ga. ..Bowen Refrigeration Supplies, Inc.
Baltimore, Md. ..... Clendenin Bros., Inc.
Baltimore, Md. ..Melchior, Armstrong, Dessau Co.
Binghamton, N. Y. ....Syracuse Equipment Corp.
Boston, Mass. ..... A. E. Borden Co.
Bridgeport, Conn. ..... Parsons Bros.
Brooklyn, N. Y. .....
.....Coleman Electrical Supply Co., Inc.
Brooklyn, N. Y. .Melchior, Armstrong, Dessau Co.
Brooklyn, N. Y. ..... The Capson Co.
Buffalo, N. Y. ..... Root, Neal & Co.
Cambridge, Mass. .....
.....Melchior, Armstrong, Dessau Co.
Charleston, W. Va. .....
Air Conditioning & Refrigeration Supplies, Inc.
Charlotte, N. C. ..... Henry V. Dick Co.
Chattanooga, Tenn. ..... Noland Co., Inc.
Chicago, Ill. ..... H. W. Blythe Co.
Chicago, Ill. .....Borg-Warner Service Parts Co.
Chicago, Ill. ..... Fred C. Kramer Co.
Chicago, Ill. ..... H. Channon Co.
Chicago, Ill. .....
.....Automatic Heating & Cooling Supply Co.
Chicago, Ill. .....The Harry Alter Co., Inc.
Chicago, Ill. ..... Airo Supply Co.
Cincinnati, Ohio..... The Merkel Bros. Co.
Cincinnati, Ohio..... Williams & Co., Inc.
Cleveland, Ohio..... The Harry Alter Co., Inc.
Cleveland, Ohio..... Williams & Co., Inc.
Dallas, Texas ..... The Electromotive Co.
Davenport, Iowa ..... Republic Electric Co.
Dayton, Ohio..... The W. H. Kiefaber Co.
Denver, Colo. ..... Auto Equipment Co.
Detroit, Mich. ..... J. M. Oberc, Inc.
Detroit, Mich. ....Borg-Warner Service Parts Co.
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London, Ont., Canada.....
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New York, N. Y. .....
.....Melchior, Armstrong, Dessau Co., Inc.
New York, N. Y. Paramount Electrical Supply Co.
New York, N. Y. .....The Harry Alter Co., Inc.
Norfolk, Va. ..... Noland Co., Inc.
Oakland, Calif. .....Pacific Tool & Supply Co.
Oklahoma City, Okla. .....Mideke Supply Co.
Omaha, Nebraska ..... United Supply Co.
Oshkosh, Wis. ..... Gustave A. Larson
Paterson, N. J. ..... White & Shauger, Inc.
Peoria, Ill. .....Wilkins Pipe & Supply Co.
Pittsburgh, Pa. ..... Williams & Co., Inc.
Philadelphia, Pa. .....
.....Melchior, Armstrong, Dessau Co., Inc.
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Phoenix, Ariz. Refrigeration Supplies Distributor
Portland, Ore. .....
.....Bill Helber, Refrigerative Supply, Inc.
Providence, R. I. .....
.....Rhode Island Supply & Eng. Co.
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Rochester, N. Y. .....
.....Melchior, Armstrong, Dessau Co., Inc.
Rockford, Ill. ..... Gustave A. Larson Co.
Sacramento, Calif. .....Hinshaw Supply Co.
St. Joseph, Mo. ..... Bristol Supply Co.
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Salem, Mass. ..... Standard Supply Co.
Salt Lake City, Utah..... Peerless Utah Co.
San Antonio, Texas ..... Straus-Frank Co.
San Francisco, Calif. .California Refrigerator Co.
San Juan, Puerto Rico. .Refrigeration Supply Co.
Seattle, Wash. ..... Refrigerative Supply, Inc.
Sioux City, Iowa. .National Refrigeration Service
South Bend, Ind. .....The South Bend Supply Co.
South Bend, Ind. ..... F. H. Langsenkamp Co.
Springfield, Ill. .....United States Electric Co.
Springfield, Mass. ..... C. P. Payson Co.
Syracuse, N. Y. .Syracuse Equipment Corporation
Toledo, Ohio. The Heat & Power Engineering Co.
Toronto, Ontario, Canada.....
.....Railway & Engineering Specialties, Ltd.
Tulsa, Okla. ..... Machine Tool & Supply Co.
Vancouver, B. C., Canada.....Fleck Bros., Ltd.
Washington, D. C. .....Refrigeration Supply Co.
Waterloo, Iowa ..... Winterbottom Supply Co.
White Plains, N. Y. .....
.....County Seat Plumbing Supply Co., Inc.
Wilkes-Barre, Pa. ..... Radio Service Co.
Winnipeg, Manitoba, Canada.....
.....Railway & Engineering Specialties, Ltd.
Worcester, Mass. ..... Standard Supply Co.

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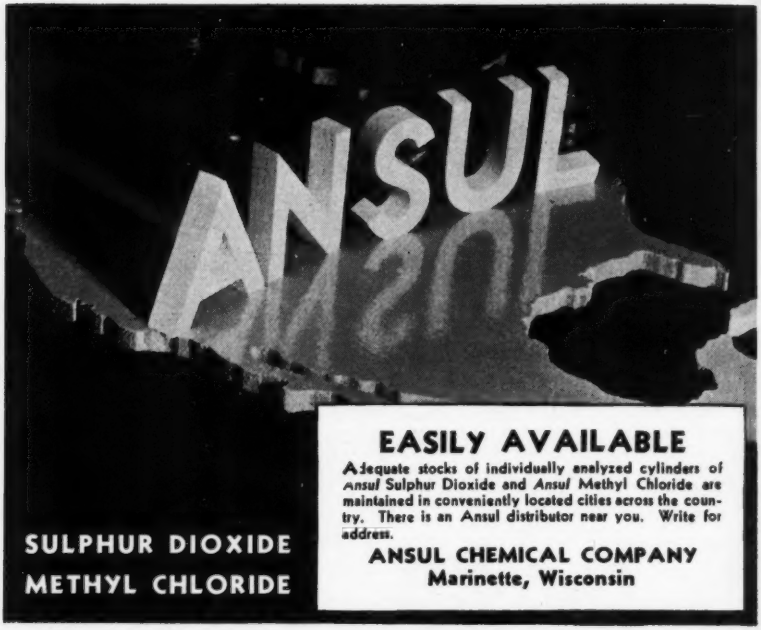
300 Fourth Ave., New York City, N. Y., U. S. A.

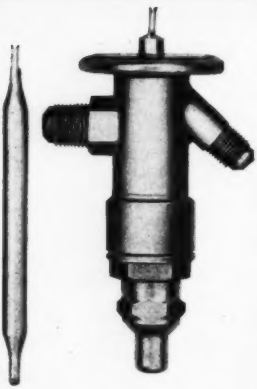


SULPHUR DIOXIDE
METHYL CHLORIDE

EASILY AVAILABLE

Adequate stocks of individually analyzed cylinders of *Ansul* Sulphur Dioxide and *Ansul* Methyl Chloride are maintained in conveniently located cities across the country. There is an Ansul distributor near you. Write for address.

ANSUL CHEMICAL COMPANY
Marinette, Wisconsin



THE NEW MODEL V
PEERLESS
THERMAL EXPANSION VALVE

Velvet Action—

Here's something new in Thermal Expansion Valves—VELVET ACTION! It's a smoother, steadier opening and closing of the orifice . . . a smoother feeding of refrigerant. Only PEERLESS Model V has VELVET ACTION!

Safety Sealed—

This valve is "Safety Sealed" in a tamper proof metal container. That's your guarantee that the valve reaches you in the same condition in which it left the factory—your guarantee that it's a genuine PEERLESS Model V Valve.

PEERLESS of AMERICA, Inc.

ESTABLISHED IN 1912 AS THE PEERLESS ICE MACHINE COMPANY

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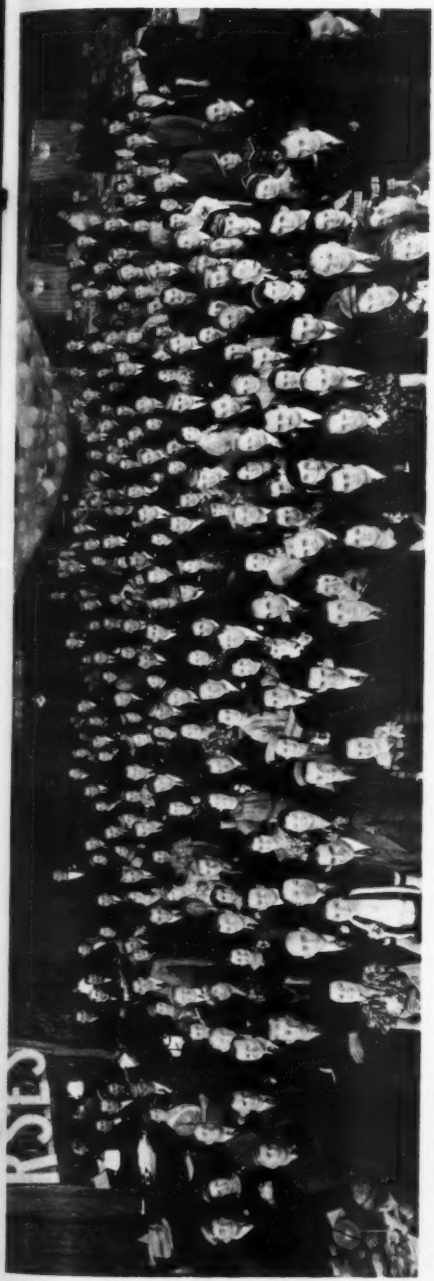

The group was fortunate in having a former member of Memphis Chapter in the person of Mr. W. McDowell, who became a member of the new organization.

Temporary officers were elected as follows: Wm. McDowell, *president;* E. L. Dick, *1st vice-president;* V. E. Bethell, *2nd vice-president;* R. J. Moran, *secretary;* W. L. Stelzer, *treasurer;* R. L. Ray, *sergeant-at-arms.*

SPRINGFIELD CHAPTER

THROUGH the efforts of Mr. P. W. McVay a meeting of the local refrigeration men was called with the purpose of considering the formation of a chapter in Springfield, Ill. Mr. A. L. Fait, acting as temporary chairman, explained the purpose of the meeting and after some discussion it was decided to invite members of the National Organization to attend the next meeting to explain the purposes and objects of the Society.

Mr. H. T. McDermott, national secretary, Mr. E. White, president of Tri-County Chapter, and Mr. Willis Stafford, secretary of Tri-County Chapter, attended the meeting of May 13. These gentlemen were introduced by Mr. P. W. McVay, and Mr. McDermott proceeded with an explanation of the purposes and objects of the Society, followed by Mr. White, who told of the many advantages of membership in the Society. Mr. Stafford also gave an outline of the activities of their local chapter, which provided helpful suggestions for the new group.

At the May 19th meeting temporary officers were elected, with the following results: P. W. McVay, *president;* C. A. Hasten, *1st vice-president;* Richard Potter, *2nd vice-president;* A. L. Hammond, *secretary-treasurer;* John Stoppelwerth, *sergeant-at-arms.*

CHICAGO CHAPTER ANNUAL BANQUET

THE Chicago Chapter's Annual Banquet, held at the Medinah Club, May 12, was a huge success to the approximately 300 refrigeration men, their ladies, and friends who attended, as can be witnessed in the picture on the opposite side of this page.

Upon leaving the elevators and entering the dining room on the night of the banquet, the men were presented with the Chapter's annual year book, and at the same time relieved of their tickets. The ladies were presented with a corsage of flowers, which were

with the compliments of Herman Goldberg.

The dinner was of the finest food, and generous enough in proportions to satisfy the appetites of even the hard-working service engineers. Small favors were distributed to both ladies and men during the evening.

Following the dinner, the attendants enjoyed approximately eight acts of very clever entertainment. Don Fernando's radio orchestra supplied the music, to which dancing continued until an early hour of the morning. Visitors to the party, during the course of the evening, were the European representatives to the Golden Gloves Tournament, which was held in Chicago at a later date.

Much credit should be given to Mr. Fred Roth, president of the Chapter, and his committeemen, for the success attained.

QUESTION AND ANSWER BOOK PREPARED FOR R.S.E.S. MEMBERS

A 64-PAGE 5½ by 8½-inch book, containing 139 questions and answers on actual problems which are based on experience in field and shop service and installation, and which have been answered by the Educational Committee, is being distributed to members of the Society.

Because of the practical nature of the problems, the Educational Committee is of the opinion that there is considerable valuable information contained in these questions and answers, which will be beneficial to the members of the Society, and will make a valuable addition to their literature on refrigeration.

It is cross-indexed so the questions may be easily located. It is the plan of the Society to issue these books from time to time, so that the volumes eventually will contain many hundreds of questions of a practical nature.

MR. AND MRS. BRUNTON HAVE A BRAND NEW TRAILER

MR. AND MRS. CLAUDE BRUNTON, of Huntington, W. Va., announce the addition of a brand new trailer. Yes, it is a service trailer of the "pushable-pullable" type charged with the great responsibility of carrying little Richard Myron Brunton, who arrived on May 7, 1938. At the very moment that Richard was able to open his eyes and look with wonderment at his old man for the first time, he was able to boast

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of an avoirdupois of six pounds, eleven ounces.

Can't you imagine how the buttons are popping on Claude's vest, and how proud June must be?

In addition to being President of the Tri-State Chapter, Claude Brunton is also National First Vice-President.

LONG BEACH CHAPTER ENTERTAINS LOS ANGELES AND SAN DIEGO CHAPTERS AT BANQUET

THE highlight for the Long Beach Chapter for the month was the banquet and entertainment on May 2, at which time we were hosts to the flourishing Los Angeles and San Diego Chapters.

The Pacific Broiler was chartered for the evening and approximately 140 attended. Due to the crowded condition of the hall, the photo is not at all representative of the splendid group that attended.

Following the dinner, W. W. Allison and W. H. McDowell, presidents of the Los Angeles and San Diego chapters, respectively, were introduced and talked briefly, as did the president of the Long Beach Apartment House Association and city officials.

Promptly at 9 o'clock the Medlin Studio put on a 10-act floor show, sponsored by W. J. Crofoot, manager of Allied Refrigeration, local wholesalers, and in addition, Mr. Crofoot's 12-year old son, Bob, gave an excellent exhibition of tap dancing that was second only to professional.

This was followed by the awarding of several very valuable and useful door prizes the compliments of Refrigeration Supplies Distributors through their local manager, Mr. George Goldner, and the Fred S. Dean Company.

The entertainment concluded with the initiation of Arthur L. Pregler and J. P. Kattens of Long Beach and Wm. L. Nadeau and Peter Nadeau of Los Angeles. These candidates were separately blindfolded and were required to pull tubing under an imaginary apartment house, install a unit in the dark basement of a slum restaurant with rats and mice feeding on their bare feet, with the charging of an evaporator which conveniently exploded. The candidate, being blindfolded, received a "shock" and the audience received a thrill. Various other pranks were played on the unsuspecting

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LONG BEACH CHAPTER BANQUET

The man with the pompadour, a "zoup" spoon in one hand and a cigar in the other is T. Jerry Steelsmith, president of the Long Beach Apartment House Assn. The others, reading from right to left, are: Mr. Curley, City Plumbing Inspector; W. W. Allison, president Los Angeles Chapter; L. S. Gould, president Long Beach Chapter; R. L. Darby and W. H. McDowell, president San Diego Chapter.

In the foreground, Hy Jarvis of Refrigeration Engineering, Inc., is caught getting ready to throw a biscuit at a competitor.

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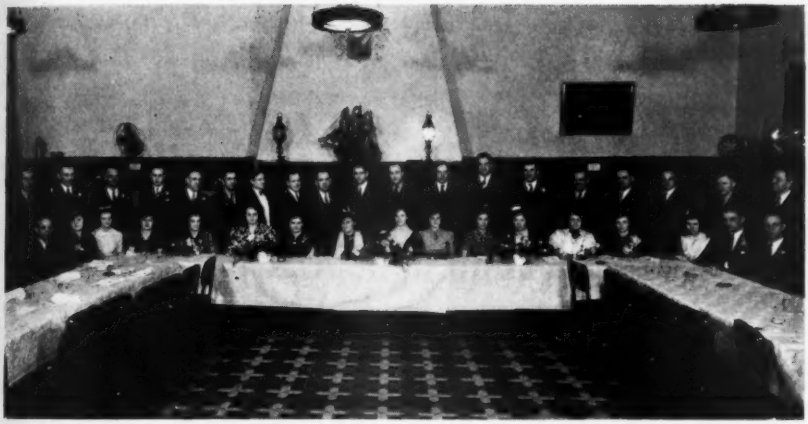

PITTSBURGH CHAPTER ANNUAL BANQUET—The first annual banquet of the Pittsburgh Chapter was held in Stouffer's Restaurant on Monday, April 25, 1938. Forty persons were present for the dinner. After the dinner, singing was by Mr. Laderer, ably assisted by Mr. McCauley. Five reels of travel movies were shown through the courtesy of the Cunard Line. After an hour of socializing the meeting adjourned to the headquarters of the Kooler Keg Co., where Mr. J. K. Jackson was the host to the group.

The committee in charge of this banquet was L. C. Laderer, H. A. Biber, W. H. Barnes and A. H. Shipman.

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candidates and upon taking the obligation they realized that they had taken the acid test of a qualified refrigeration service man. The participants in the initiation, in addition to the candidates, included: E. T. Hogan, H. M. Warren, P. G. Bullington, E. L. Murphy, A. J. Eisenbeiss, E. B. Gunsauls, E. T. Langston, D. Voorhis and L. E. Wendel.

President Gould presided and R. L. Darby was Master of Ceremonies.

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THE "CONTRIBS' COLYUM"

By THE KINGFISH

MESSRS. Herman and Harry Goldberg visited Paul Jacobsen in Marion, Indiana, taking moving pictures of rural life and enjoying some of Paul's chickens.

June and Claude Brunton now have a new little "Service Engineer!" Richard Myron was born on May 7, 1938. Congratulations!

William Sevy, of Wabash, Indiana, makes so much money now that he throws \$10.00 bills away when he attends the local "movie."

We hear that Art Wolf, of Elgin, Illinois, is so refrigeration-minded that he gets up in the middle of the night and taps walls and adjusts expansion valves.

Herman Long, secretary of the Chicago Chapter, was married recently. Just another free lance to be domesticated, but we congratulate you, Herman, and may all your troubles be servicemen!

Did you know that Paul Jacobsen has added rabbits to his collection of live stock?

L. C. McKesson, the genial representative of the Ansul Chemical Company, has delivered a number of talks on the products of his company, but the one he favors most is entitled, "The Romance of Refrigerants." Leave it to L. C. to think of romance!

Warning—If you see Irv. Knudson, of Detroit Lubricator, Frank Gleason, of Copeland, and John Stubbs of G. E., in a huddle, you can be assured that some novice is being initiated into the game of "Cork-a-loo" and not far away, you will also find Jack Colyer, of Wolverine Tube, most willing to referee the game.

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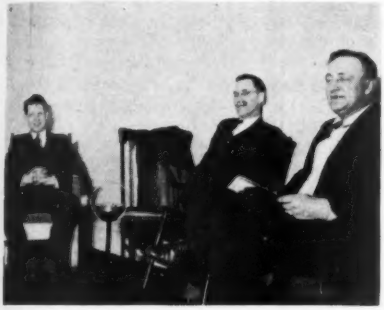
Mr. R. Douglas Marshall, representative for Automatic Products Company and Henry Valve Company, with Mr. E. L. Bengston, of the Republic Electric Company of Davenport, Iowa, held a meeting at the Ballingall Hotel in Ottumwa, Iowa, on May 4, for the refrigeration men of that vicinity. All of the refrigeration servicemen and dealers who attended this meeting were given the latest information on thermostatic expansion valves and dryers.



Left to right—Mr. Overdurf, Mr. Friday and Mr. Day

Chapter Notes

Under this heading will appear news of the chapter meetings. For names of the officers and dates of regular meeting nights, please refer to the Chapter Directory.

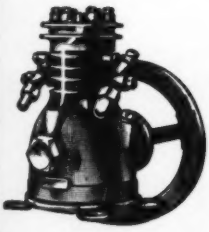
CLEVELAND CHAPTER

April 14—After the regular business session, which was cut to a minimum, the meeting was turned over to Mr. Jack Dannels of the Fedders Mfg. Co., who gave a very interesting talk, aided by a display panel, on the products of the Fedders Mfg. Co.

MADISON CHAPTER

April 26—The meeting opened with some discussion on the party being planned and reports were given as to prices obtained at the various hotels and clubs. Nothing definite was decided and the chairman of arrangements was instructed to continue with his investigation.

Mr. Buschkopf gave a very concise report on a meeting at Oshkosh where plans are being made for a new chapter. Mr. Buschkopf reported that forty-five men attended this meeting and that some had driven as far as 125 miles.



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Mr. Larson then introduced Mr. Mel Knight of Peerless of America, Inc., who gave a brief talk on the products of his company and then showed a movie of the Peerless plant which was taken by himself. Methods of building coils and valves with special reference to the new high dispersion coil, which cuts down the amount of coil needed in air conditioning, were explained.

May 10—Mr. Buschkopf reported on the second Oshkosh meeting, stating that eleven paid-up members had been secured to date, and also that at this meeting the Ansul Chemical Co. had given a very interesting talk and demonstration.

Mr. G. Larson then introduced Mr. McKee of the Detroit Lubricator Co., who gave a very excellent demonstration of their products and then treated the boys to refreshments after the meeting.

KANSAS CITY CHAPTER

May 10—Educational Chairman — J. De Wilde—introduced the speaker for the evening, Mr. C. L. Hataway, who gave a resume of the different kinds of motors, how made and where originated, also explaining service methods and answering questions for the members. This talk was very much appreciated by those present.

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May 24—The meeting opened with a discussion on the forthcoming membership drive. Chairman H. F. Andrews asked for suggestions and also the cooperation of the members. A report on definite plans regarding this drive will be forthcoming at the next meeting.

The meeting was then turned over to the Educational Chairman, who called on the members who had been assigned special topics from the February issue of THE REFRIGERATION SERVICE ENGINEER. Mr. Andrews gave a review on the article, "Head Pressures in Air Cooled Units," Mr. E. Bloesser on, "The Effects of Moisture," and Mr. A. M. Hoover on "Combination 'U' Gauge and Draft Gauge." Mr. Hoover demonstrated the one he had made for the purpose from the February issue.

Following this, new topics were assigned to other members for the next meeting from the March issue of the Official Organ.

PITTSBURGH CHAPTER

May 13—The meeting opened with a discussion of the Membership Committee's duties and activities, and the plans as outlined for the passing on applications for membership. A motion was duly passed that all applicants for membership be required to pass an examination before being granted active membership.

Visitors for the evening introduced by President E. V. Black, were Mr. P. T. McCormack of the Joseph Woodwell Co., and Mr. J. K. Jackson of the Kooler-Keg Co.

On the educational program of the evening, Mr. N. D. Wagener led a discussion on servicing hermetics, thermostatic expansion valves and high side floats.

MISSISSIPPI VALLEY CHAPTER

May 13—Mr. J. Lonnie Fish introduced the speaker of the evening, Mr. D. V. Sutton of the Dayton Rubber Mfg. Co. Mr. Sutton

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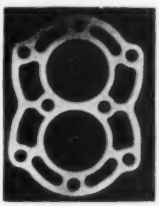

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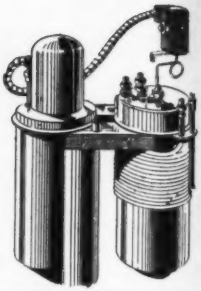


showed sound pictures on Dayton V-belts, which added to the interest of his talk. All members present appreciated having the opportunity of hearing him.

Visitors of the evening were Mr. B. F. Wood, C. W. Dennis, and the Chairman of the Educational Committee of Des Moines Chapter—all of Des Moines, Iowa. Mr. Wood talked to the members in regard to the state meeting to be held in the near future and advised that all refrigeration men in the state of Iowa would be invited. The opportunity of discussing these plans with these men was very much appreciated.

The forming of an initiation team was proposed, and Mr. E. Dick was appointed to serve as chairman on this committee, with the privilege of picking his own team.

ST. LOUIS CHAPTER

May 12—In order to devote as much time to the educational feature of the evening as possible, the business of the chapter was dispensed with. President L. L. Vollman introduced Mr. G. C. Hazard of the Socony Vacuum Oil Co., Inc. Mr. Hazard gave an interesting talk on the properties and characteristics of lubricating oils in general and refrigeration oils in particular. At the conclusion of his talk, questions were answered and then an interesting film entitled "Lubrication" was shown. Following this, a second film entitled "Heads up Baseball" was shown.

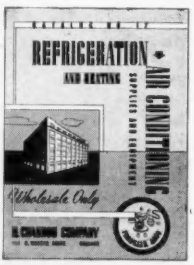
SCRANTON CHAPTER

March 3—The first meeting of the Scranton group of refrigeration men held for the purpose of organizing a chapter was held on March 3. An election of temporary officers took place at this meeting, with Mr. William Franklin being elected president; Mr. Fred Gethman vice-president, and Mr. C. G. Hess secretary-treasurer, all of whom were elected unanimously.

It was decided to hold meetings on the first and third Tuesdays of each month.

Sixteen members were present at this meeting, all of whom expressed a desire to form a chapter.

The second meeting was held on March 15th, during which a By-Law Committee, Publication Committee, Code, and Membership Committee were appointed. A future meeting place was decided upon and it was announced that the next meeting would be



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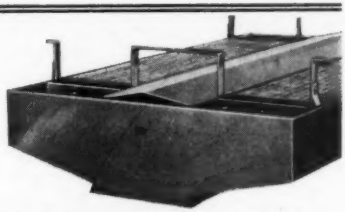

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held in the Junior Mechanics Hall on Alder Street.

On April 5th it was decided to apply for a charter from the National Society. Fifteen members had to date signed applications and paid their dues.

Further meetings were held April 19th and May 3rd, with very good progress being made by the new chapter.

WICHITA CHAPTER

May 6 — The educational feature of the evening was presented by Mr. C. A. Hulsman of Peerless of America, Inc., who gave a fine talk on his company's products and passed around a sample of the new type coil manufactured by his company.

A round-table discussion on service problems followed, participated in by all present, which brought out many good facts.

May 20—The Secretary was instructed to order new stationery for the chapter and continue the use of cards for notification of meetings.

Mr. Blake and Mr. Warner signed applications for membership, and Messrs. Allen Woolridge and Henry B. Till were given the obligation.

After some discussion on the matter, it was decided to secure a Question Box in which questions from the membership could be placed, making it unnecessary to sign their names to them.

ROCKFORD CHAPTER

April 18—A report from the Entertainment Committee was made on the forthcoming dance to be held April 30th. After some discussion on a change of meeting place, President R. C. McCarthy announced that the Nelson Hotel had agreed to a very desirable arrangement and it was therefore decided to continue the use of these rooms for future meetings.

An invitation from the Madison Chapter to attend their picnic was extended through Mr. G. Larson.

On the educational program for the evening, Mr. Bob Anderson of Imperial Brass Mfg. Co. gave a demonstration of Imperial products.

Mr. G. Larson gave a demonstration of Rotary seals.

Refreshments were served following the meeting through the courtesy of the Rotary Seal Co. and the Gustave A. Larson Co.

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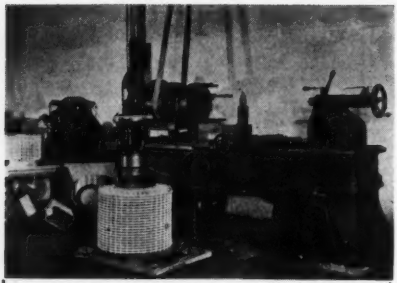

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DAYTON CHAPTER

May 13 — Some discussion was held on plans for a meeting to be held in Springfield, Ohio. Mr. G. Click and L. Dennis will have a report for the next meeting with the final arrangements.

The meeting was then turned over to Mr. H. Shoupp for the educational program, who presented a very interesting period for the members present.

CHICAGO CHAPTER

April 12—The first feature of the evening was a motion picture of the construction of General Electric monitor top refrigerators, followed by a reel depicting General Electric sales methods. Both of these pictures were found to be very entertaining as well as educational and were enjoyed by all who were in attendance.

The business of the evening was then taken up during which the new system of button identification was constituted, and each member was presented with a 3¼-inch button on which his name is inscribed. The purpose is to get the members better acquainted with each other.

The business session was then adjourned and the meeting turned over to the representatives of the Alco Valve Company, who with the aid of slides demonstrated the operation of thermostatic expansion valves. This talk continued for one hour and was very much liked by everyone.

April 26—Designated as Herman Goldberg Night, and with a record attendance of over 300, Mr. Goldberg took over and showed two reels of movies, the first of the Ranco factory and the second of the Ansul Chemical laboratory. The first showed the construction of all types of Rancostats, and the many large machines used in the process of manufacture. The second reel showed a series of experiments explaining the many dangerous hazards of aluminum parts in methyl chloride systems. These pictures were very much liked by the assembly and we hope to have more of them in the future.

Mr. Monjian then introduced the master of ceremonies for the evening, who called on a piano and singing team. This was followed by a ventriloquist and his dummy. After a lot of good entertainment we all adjourned to the bar for refreshments. Both refreshments and entertainment were supplied by Mr. Goldberg.

May 10—The annual banquet to be held May 12th follows closely after this meeting

so the business of the evening was strictly concerning the banquet affairs.

Among those present were Mr. McKee and Mr. Van Tuyl of the Midwest Engineering and Equipment Co. Mr. Van Tuyl then took over and gave a marvelous talk and demonstration of the Leak-Alarm in use on air conditioning and large commercial equipment. A complete alarm was set up and although we didn't have two-hundred-and-fifty-volt power to operate the various relays of the alarm, it was nicely demonstrated and we are sure that everyone present was very much impressed with its usability. Mr. Van Tuyl then answered questions asked of him from the floor.

CENTRAL NEW YORK CHAPTER

April 5—Mr. K. L. Brandt of the Melchior, Armstrong, Dessau Co. was called upon and he introduced Mr. E. Bockmeyer of Peerless of America, Inc., who spoke on the subjects of rifled fin coils, the flask cooler, the spine coil and their expansion valve. The construction of the spine coil was found very interesting, as was the description of the machine constructing it, which cuts thousands of needle-like spines standing on the tube in an erect position.

Some discussion was brought up on the formation of a Rochester chapter and a trip to Buffalo to help form the state association of the Society.

Refreshments were served following the meeting.

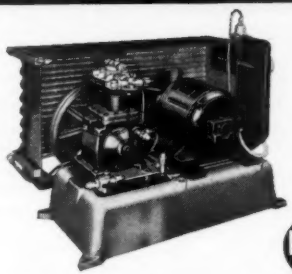
TOLEDO CHAPTER

April 11—Through the courtesy of the Ansul Chemical Company, who furnished the smelts, the Toledo Chapter held a fish fry at the Toledo Edison Service Building, 1008 W. Delaware Ave. A bingo game was started after the fry, the prizes being donated by various merchants and wholesalers around town.

April 20—A dance to be given May 19th at the Tribly Log Cabin with Hanselman's orchestra playing, was announced by the Entertainment Committee, and tickets were distributed among the members.

President A. J. King read an item concerning charges for labor in service work and it was decided to conduct a discussion on this matter at a future meeting. Mr. Tom Lester of the Automatic Products Co., speaker of the evening, gave an interesting talk on the diaphragm type expansion valve, comparing it with the bellows type and showed the construction of the valves.

For Service Replacement and New Installations



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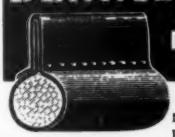

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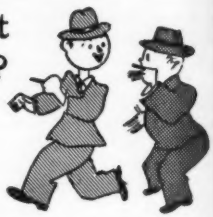

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NEW CATALOGS AND BULLETINS

THE IMPERIAL BRASS MFG. CO.—A complete line of copper tubing service tools, plus a handy tool selector, which makes it a simple matter to select quickly and accurately the proper tool for any tube working job on copper, brass, or aluminum tubing, are featured in a new folder which has been issued by The Imperial Brass Mfg. Co.

Nine tube working jobs are listed in the folder, namely—cutting, flaring, bending, coiling, soldering, pinch-off, swedging and the auxiliary jobs of rethreading and refacing. Tools for each of these jobs—for various sizes of tubing—are indexed in the folder's tool selector and the various tools are completely described on the inside pages.

Seven tube cutting devices, four flaring tools, six types of bending and coiling equipment, a complete soldering outfit, two pinch-off tools, a swedging tool kit, and two types of refacing and rethreading tools are described in the folder. Also shown are three complete tubing service tool kits.

Copies of this new folder, which is attractively printed in orange and black, may be obtained by writing The Imperial Brass Manufacturing Co., 1200 W. Harrison St., Chicago, Ill., and requesting Form 299.

HARRY ALTER COMPANY.—Parts and supply catalog. "This catalog is the largest the company has published and contains 128 pages of merchandise. It is claimed that it is the largest and most complete catalog devoted exclusively to refrigeration servicemen and dealers. It is the first alter catalog published this year which has contained major changes. This catalog contains the complete lines of the finest and oldest manufacturers in the parts supply business, as well as showing many new gadgets and the latest developments in refrigeration parts. The biggest innovation in this issue over the previous ones is the fact that it catalogues and displays a complete line of Delco motors and parts as well as a complete line of Wagner motors and parts. Also added is the line of Minneapolis-Honeywell controls and standard evaporators and ice cream cabinet units.

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DEPENDABLE ITEMS FOR ALL YOUR NEEDS

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A MIDGET WITH THE PULL OF AN ELEPHANT. EVERY SERVICEMAN AND SHOP NEEDS ONE. MADE OF HIGH GRADE STEEL. STURDY, COMPACT, LIGHT WEIGHT (2¼ LBS.). WILL MEET PRACTICALLY ALL REQUIREMENTS WHERE A PULLER IS USED. UNIVERSAL IN ITS SCOPE OF USES.

PRICE $6.75 F.O.B.

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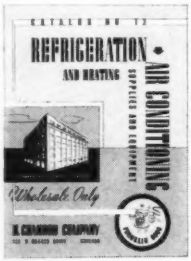
133-22 41st Avenue **FLUSHING, N. Y.**

"In addition to these new lines we have added new items and revised the lines of all of the manufacturers whose products we distribute."

H. CHANNON COMPANY, 133 N. Wacker Drive, Chicago, Ill.—Catalog No. 12. 126 pages of refrigeration, heating and air conditioning supplies and equipment. All prices

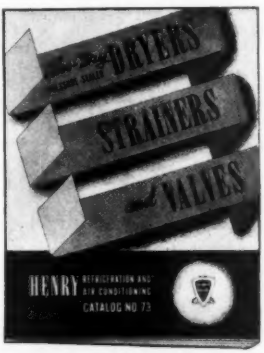


in this catalog are list prices with a removable discount sheet in the front of the book. Convenient in size and very attractively covered. Can be used as a sales book and shown to your customers.

Write for your copy today on your company stationery.

HENRY VALVE NEW DRYER

TO completely eliminate the trouble caused by moisture in refrigerating system operation, the Henry Valve Co., 1001 North Spaulding avenue, Chicago, Illinois, has recently developed an exclusive vacuum dry-



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ing and pressure sealing process that not only removes every trace of moisture from the dryer, but also provides a positive means of indication that no absorption of moisture has taken place up to the point of actual in-

A Selling and Servicing Opportunity!

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. . When You Spot This Common Trouble

When a customer's cooler doesn't work right—when dead air spots and freezing zones impair foods and humidity is too high or low—it's time to show him Action-Air System—the correct air circulation in coolers. Sells itself on a demonstration. Pays for itself out of savings. Makes good profit for you—adds new customers — leads to repeat business. Used in wide variety of applications since 1932. Write for our attractive proposition today. The Brown Corp., 613 Bellevue Ave., Syracuse, N. Y.

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abolishes such sprints to obviate injury to eyes, nose, throat and lungs. Positively—it is one of the **essential** tools of the trade. Be forearmed. Get, and use, this light, sturdy, soft, and extra comfortable, Fume Kit. Comes equipped with cartridges for the gases mentioned above. Cartridges for other industrial fumes are available. Moderate price. Write today.

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ELECTRIMATIC WATER REGULATORS

TYPE WL
FOR
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FURNISHED IN ⅜" IPS FOR COMMERCIAL REFRIGERATION OR AIR CONDITIONING CONDENSING UNITS

BRONZE BODY REPLACEABLE VALVE SEAT AND SEAT DISC

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THE ELECTRIMATIC CORP.
2100 Indiana Ave., CHICAGO, ILL.

stallation. When a seal cap of the new Henry Dryer is removed prior to installation, there is a hissing sound, due to the escape of dehydrated air indicating that the dehydrant is absolutely dry.

A new catalog describing the complete Henry line has just been issued. Copies may be obtained by writing to the Henry Valve Co., Chicago.

* * *

NEW UNIT FOR MILK COOLING

CLIMAXING many years experience in the building of refrigeration equipment of all types, engineers of Frigidaire Division, General Motors Corp., have developed a new "drop-in" milk cooling unit which can be installed in any standard type of milk cooling cabinet.

The new unit consists of a cooling coil and motor driven water circulating device enclosed in a cylindrical steel shell. The cooling coil is connected to and refrigerated by means of a Frigidaire compressor.

The unit is shipped from the factory as a complete assembly which may be readily installed in an old or new milk cooling cabinet and plugged into a convenient electrical outlet.

Proper temperature in all parts of the milk cooler are assured by the circulator which keeps the water bath constantly circulating during the cooling operation. Cooling to temperatures below 50° as required by many states is also insured, thus retarding bacteria growth and eliminating spoilage and rejection losses.

The unit is completely automatic in operation, eliminating the labor required by the old style cooling systems. The new Frigidaire "drop-in" milk cooling unit which is surprisingly low in cost is available in two sizes for cooling two to six cans of milk per day. It is ideal for the requirements of the small dairy.

* * *

JAS. P. MARSH CORPORATION IN NEW LOCATION

ANNOUNCING the removal of their offices from 551 Fifth Ave. to larger quarters located in the Commerce Bldg., 155 E. 44th St., New York City, the Jas. P. Marsh Corporation states that the new quarters provide space for an increased stock of Marsh gauges, valves and traps, which will be available for their customers. There are always parking facilities for pick-up trucks at the new location.

PENN NAMES WEGNER TO POST AS SALES ENGINEER

G. A. WEGNER, Minneapolis, Minnesota, for many years identified with the control and accessory branches of both the heating and refrigeration industries, has been added to the factory staff of sales engineers of the Penn Electric Switch Co., Goshen, Indiana, according to an announcement just issued by R. H. Luscombe, sales manager of that company.

"For twelve years Mr. Wegner has been engaged in sales engineering work in the control and accessories fields, especially in the Middlewest," said Mr. Luscombe in making the announcement. "Almost all of his time has been spent in the field with buyers and users of controls and accessories for heating and refrigeration service, making him well qualified to discuss these problems with users of Penn controls from a practical field standpoint.

G. E. WEGNER,
FACTORY SALES ENGINEER

"Mr. Wegner is especially well known to these two industries in Minnesota, North Dakota, South Dakota, Montana, Nebraska, Iowa, parts of Wisconsin and Illinois. In his new capacity with Penn Electric Switch Company Mr. Wegner will work as a factory sales engineer out of the headquarters office of the company at Goshen, Indiana.

"For several months Penn Electric Switch Co. has been carrying out a planned program of broadening sales engineering service to manufacturers, jobbers, contractors and dealers in the heating and refrigerating fields and the addition of Mr. Wegner to Penn's staff at this time is a continuation of this policy."

How to Get RELIABLE Temperature Records

• You know how important temperature records are for test or installation work. But do you know about Practical recording thermometers? Endorsed by servicemen and engineers. Used in air conditioning, refrigeration, and heating. Unusually low priced. Sturdily built. Guaranteed. Give dependable records. Completely portable and self-contained, 7½ in. high. Get complete information.

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PRACTICAL Recording Thermometer

PRESENTING A NEW LINE OF GENERAL CONTROLS
Relays
FOR THE AIR CONDITIONING INDUSTRY

These new relays are built specifically to meet the needs of automatic heat and air conditioning installations. Designed, manufactured and tested by the General Controls Co.

RS-100 RELAY . . . Handles single-phase motor loads up to 1 H.P. or heating loads up to 1.5 K.W. Uses a double-break relay and integral transformer for supplying power to small indicating lamps, wall clocks, or small sensitive relays. Normally open. Two wire.

RELAY PACKAGE SET . . . For the control of coal stokers, air conditioning equipment, blower furnaces, hot water heating and industrial applications.

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GENERAL CONTROLS

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Insulate those Cold Lines with
MILLER SPONGE RUBBER TUBING

★ You, who are searching for an efficient, easy-to-install insulation for cold lines on air conditioning and refrigeration units, will find Miller Sponge Rubber Tubing made to order for your needs. The cellular construction of Miller sponge rubber makes for a material possessing superior insulating qualities. It is applied quickly to new or old lines by simply slipping over the pipe. Bends and angles present no problem in the installation of this flexible tubing.

Miller Sponge Rubber Tubing is available in inside diameters of ¼" to ¾". For sample and prices, see your local jobber or write direct to

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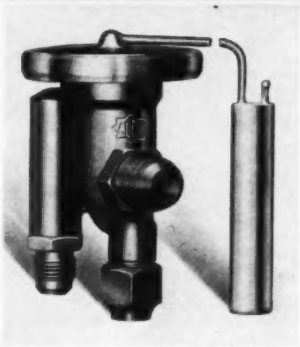
"Engineers in Rubber"

It Will Pay You to See Your Jobber for ALCO'S New Low Cost Small Capacity

"TK" THERMO VALVES



● Built to famous Alco standards of accuracy and trouble-free service, the "TK" incorporates all the proven advantages of Alco "T" Series Thermo Valves at a saving of 20 to 40% over previous Alco small capacity controls. The "TK" is thus within the reach of all small refrigeration and air conditioning systems — a moderate price valve for small installations.

Alco Thermo Valves have always been noted for accurate control. Alco control restricts the line of complete evaporation to the narrowest limits—utilizing the maximum amount of evaporator surface and resulting in highest evaporator efficiency.

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1. Atomic hydrogen welded power assembly that reduces failures to an absolute minimum.
2. The entire valve will stand full test pressure without injury.
3. Large and completely adequate filter area — over 1¾ square inches of filter surface.
4. Light weight, simple design—yet as sturdy as all the larger Alco models.
5. Available in several line sizes and capacities for both Methyl Chloride and Freon (F12).

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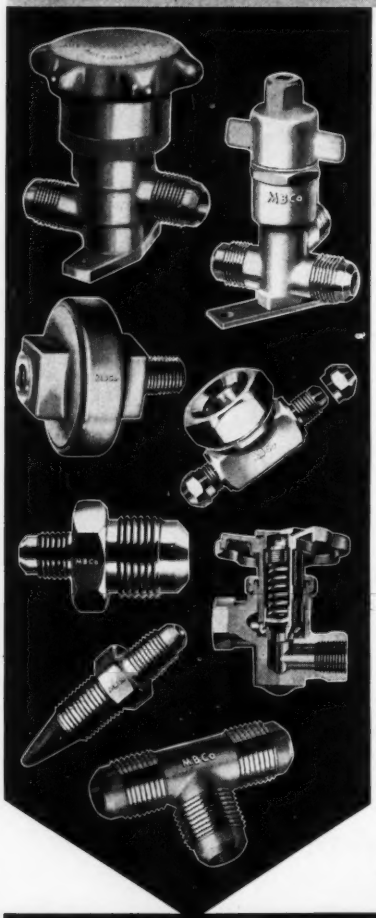
ENGINEERED REFRIGERANT CONTROLS — ALCO — FOR HIGHEST EVAPORATOR EFFICIENCY

VALVES. PIPE AND FITTINGS
for all AIR CONDITIONING *and* REFRIGERATION *Requirements*



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Answer Your Filtration Problems

The patented Zenith edge-type filter element consists of two kinds of stampings arranged on a central stem. (See illustration.) Every second stamping resembles a wheel, in which passages for the discharge of the liquid are bounded by the spokes and the rim. These wheels are separated from each other by stampings resembling stars, only .002″ thick. The width of the filtering slots is, therefore, only .002″, or two and a half times finer than 120 mesh screen.

The drawing of the Zenith Filter Element shows how the fluid passes through the fine interstices that are 2½ times finer than 120 mesh screen.

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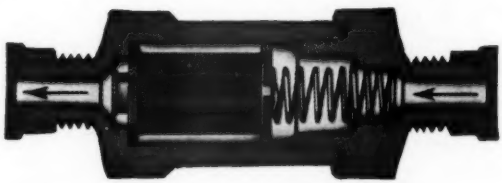

Experience proves that this quality of filtration is necessary to assure proper closure of needle valves as used in expansion valves, float valves, solenoid valves and other liquid-control devices.

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Subsidiary Bendix Aviation Corp.

DETROIT, MICHIGAN

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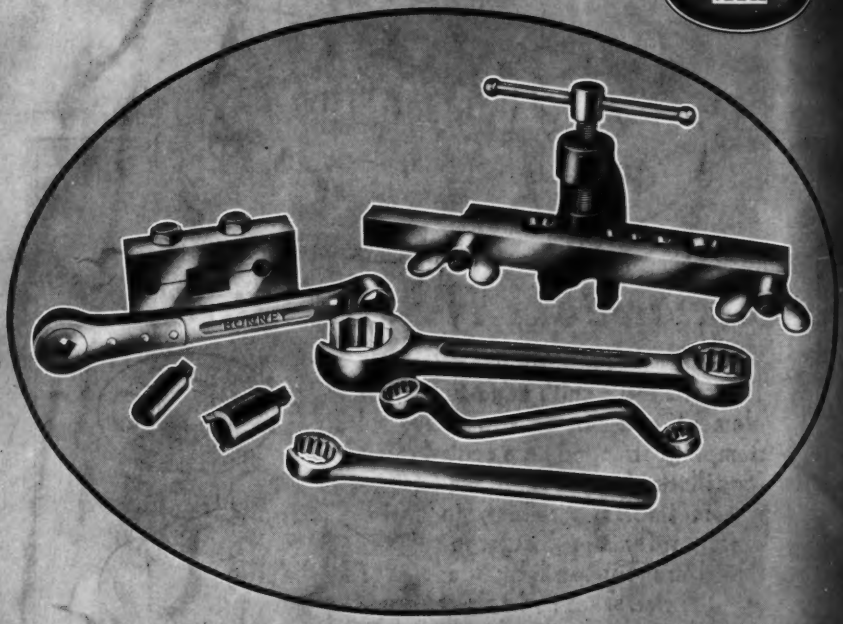
BONNEY TOOLS



Bonney Specialized Refrigeration Tools

NO matter what your tool requirements may be for refrigeration service work—Bonney has the right tool for every job.

Complete lines of sockets with detachable handles and attachments, box wrenches, open-end wrenches, flare nut wrenches, special refrigeration ratchets, valve stem sockets, packing gland nut sockets, flaring and pinch-off tools, tube benders and cutters, punches, chisels, hammers, pliers,—all are included—and each has gained a world-wide reputation among mechanics and service engineers as "The Finest That Money Can Buy."

Made of selected steels, carefully heat-treated, they will withstand years of constant use. Each is designed specially for its particular job.

Catalog No. 38R shows the full line of Bonney Specialized Refrigeration Tools. Write for your copy today.

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Stocked by Leading Jobbers Everywhere

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